ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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What in the World!

Very artistic indeed! Dr. Alexander Sachs of NIRA says: "We are building a violin, writing the music, learning to play it—all at the same time." Next comes the threat of Attorney Richberg with the added statement: "I don't know any more what is going to come out of these hearings than I know who is going to win tomorrow's baseball game." The sport and the artist are sure to introduce some new ideas into business.

●

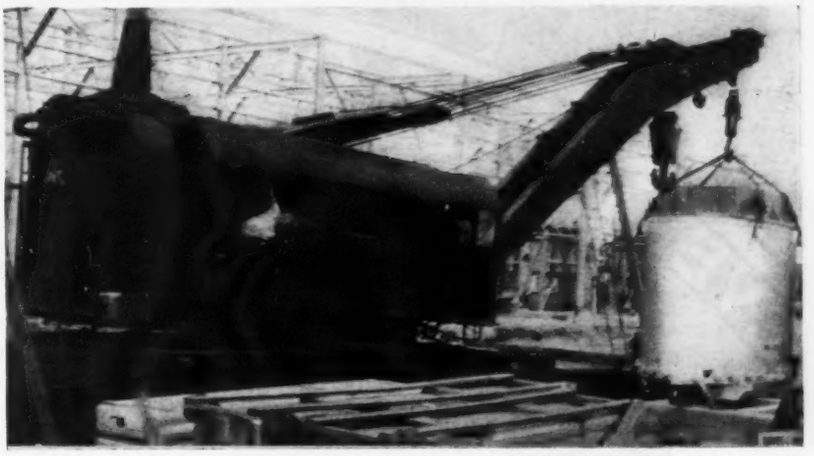
Nobody would buy copper at 5 cents a pound; now it is eagerly sought at 9 cents a pound. The dollar is now worth 73 cents in gold and may be made a commodity dollar only. The government finances sales of cotton to the Soviets. The President returns from a sea trip to stick action pins into his administrative boards. These are just samples of hectic behavior that have no explanation in logic or reason, but do make this an interesting period in which to live.

●

The first of the fall sales ideas is "More Light—Better Sight." We believe the idea is good. It starts as a multitude of local efforts to stimulate lighting and should be supported. Other sales plans should follow, for this industry must sell and can sell. Note that refrigerator sales are booming, with most of them sold for cash in full.

●

The latest is a business advisory and planning council for the Department of Commerce. The purpose is to bring business into co-operation with the government, first to give taxpayers the best departmental service and, second, to give direction or long-range perspective to current business trends. This is a very competent group and we look hopefully toward its work.



Locomotive crane unloading 22,500-kva. transformer on its foundation

JULY 15, 1933

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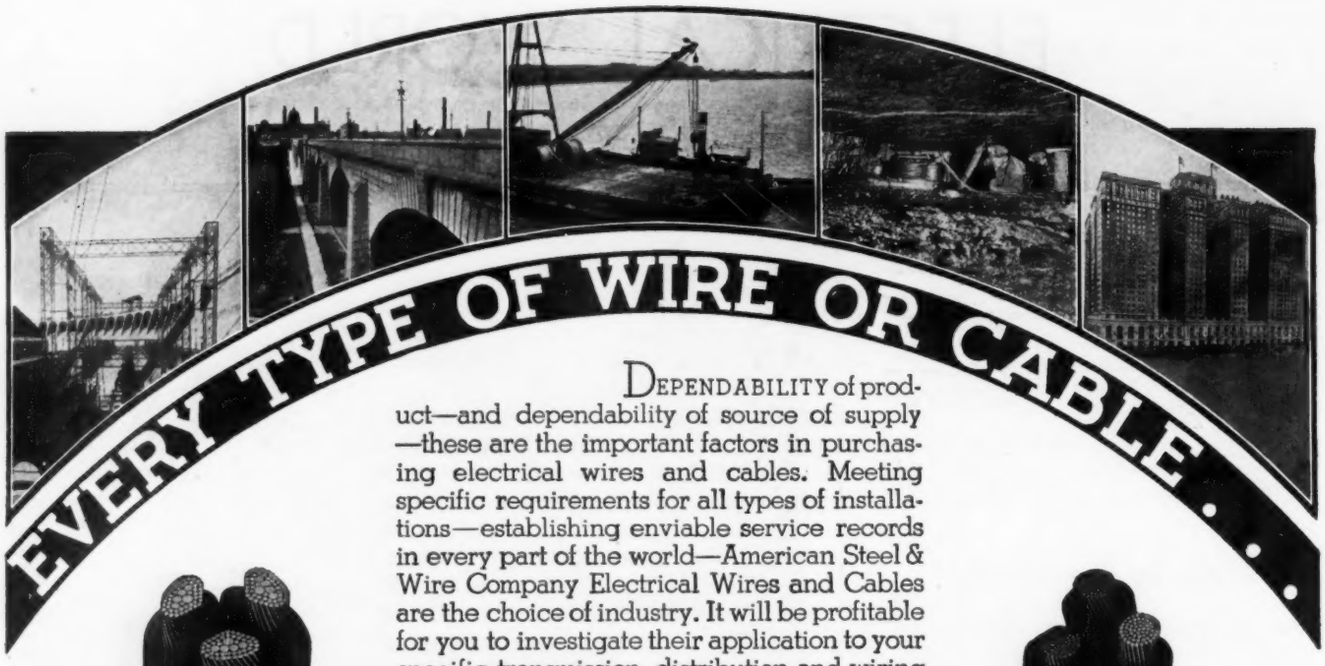

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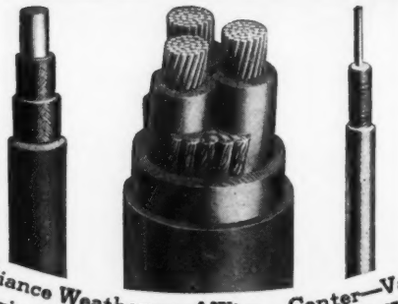
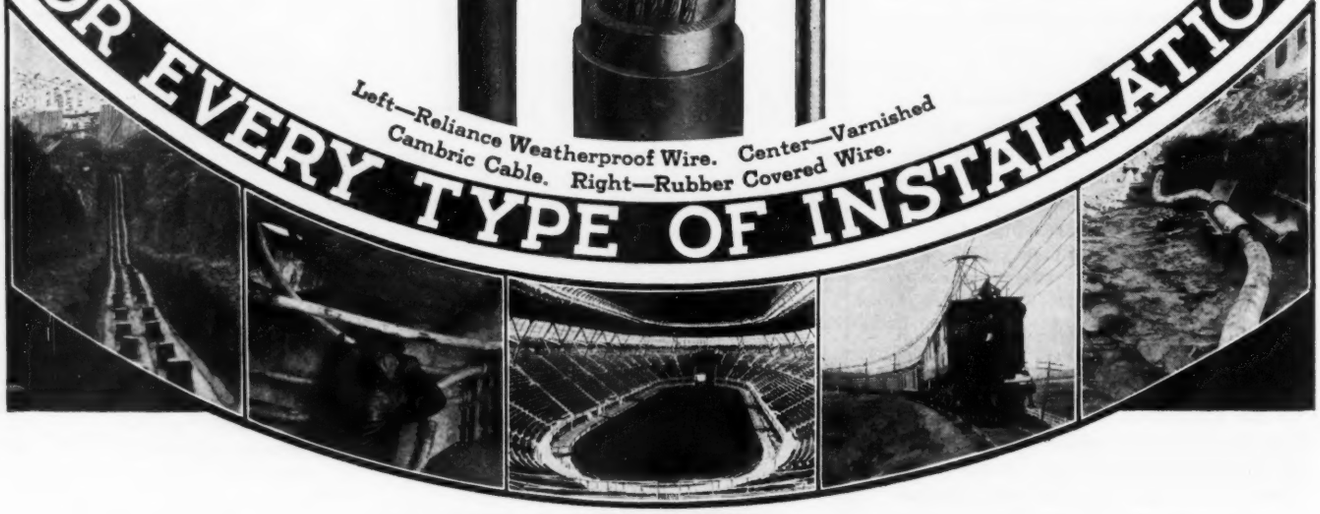


Left—Reliance Weatherproof Wire. Center—Varnished Cambric Cable. Right—Rubber Covered Wire.

FOR EVERY TYPE OF INSTALLATION



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ELECTRICAL WORLD

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for the Week Ending

July 15, 1933

Manufacturers Adopt NIRA Code

Basic wage 35 cents.

36- and 40-hour weeks.

Cost accounting and statistics provided.

Supervising agency for each product group.

AN APPLICATION to the President of the United States for approval of a National Industrial Recovery Code for the electrical manufacturing industry was forwarded to the Federal Administrator on July 11. The action was authorized by the board of governors at a meeting on July 11 called to consider the report of its committee on the subject. Invitation to attend had been telegraphed to executive members of all companies not already represented by membership in the NEMA board and 130 were present.

The history of the code is as follows: At the May meeting of NEMA the board was authorized by unanimous vote to do and perform any and all things that may be permitted or required by the provisions of the national industrial recovery act. On June 23 it met to consider a purely tentative formulation which had received the comment and criticism of the federal authorities. It appointed a committee to prepare a second formulation embodying changes and to discuss it formally with the Federal Administrator. The members of the committee were President Tritle, Clarence L. Collens, Frank C. Jones, George W. Mason, F. R. Fishback, P. B. Postlethwaite and R. J. Russell.

This committee met on June 24 in New York. It met again in Washington on July 5 and 6 in conference with Deputy Administrator W. L. Allen, assigned by General Johnson. The first session was practically continuous from 8:30 a.m. on July 5 until 2:30 a.m. on July 6, the deputy administrator being present for a total of more than eleven hours. On July 6 came the final conference with the deputy administrator, lasting some three hours for final consideration of the code as modified by previous discussion. The association's counsel, Francis E. Neagle, and the managing director were present at all sessions.

The deputy administrator was aided in his consideration by an adviser from the economics division of the Administration and by Gerard Swope as industry adviser appointed by the industry advisory committee. The labor advisory committee had been asked to supply an adviser for labor, but none was available.

The deputy administrator made clear that it was neither the desire nor intent of the Administration to dictate what should be embodied in the code. Final determination as to this lay with the submittors. The sole purpose was to advise or suggest in the light of knowledge of policies and opinions which was available to the administrator and to make available an estimate of the possibilities or difficulties which might accompany any specific proposal. The attitude throughout was one of courtesy, intelligent, unbiased consideration and co-operation.

The expressed desire was for the preparation of a code which should embody only the essentials actually required at this time, this to be supplemented from time to time as developments made necessary.

The date announced in Washington for the hearing on this code is July 19. The complete code adopted July 11 is as follows:

National Industrial Recovery Code for the electrical manufacturing industry

To effectuate the policy of Title I of the national industrial recovery act, the following provisions are established as a National Industrial Recovery Code for the electrical manufacturing industry:

I. DEFINITIONS: The term "electrical manufacturing industry" as used herein is defined to mean the manufacture for sale of electrical apparatus, appliances, material or supplies, and such other electrical or allied products (for example, absorption type refrigerators) as are natural affiliates. The term "person" as used herein shall include natural persons, partnerships, associations and corporations. The term "employer" as used herein shall include every person promoting, or actively engaged in, the manufacture for sale of the products of the electrical manufacturing industry as herein defined. The term "effective date" as used herein is defined to be the eleventh day after this code shall have been approved by the President of the United States.

II. As required by Section 7 (a) of Title I of the national industrial recovery act, the following provisions are conditions of this code:

"1. That employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection; (2) that no employee and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing, or assisting a labor organization of his own choosing; and (3) that employers shall comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment, approved or prescribed by the President."

III. (a) On and after the effective date employers shall not employ any person under the age of sixteen years.

Basic wage 35 cents

(b) On and after the effective date the minimum wage that shall be paid by any employer to any person engaged in the processing of the products of the electrical manufacturing industry and in labor operations directly incident thereto shall be 35 cents per hour, provided, however, that casual and incidental labor and learners may be paid not less than 80 per cent of such minimum wage, but the total amount paid to such casual and incidental labor and learners shall not exceed in any calendar month 5 per cent of the total wages paid to all process labor by such employer.

(c) On and after September 1, 1933, the minimum wage that shall be paid by any employer to all other employees shall be at the rate of $14 per week, provided, however, that office boys or girls, learners and casual employees may be paid not less than 80 per cent of such minimum wage but the total amount paid to such office boys or girls, learners and casual employees shall not exceed in any calendar month 5 per cent of the total amount paid by such employer to all employees covered by the provisions of this paragraph (c).

(d) The minimum rates of wages provided in this article shall apply to all persons employed in cities of 200,000 and over. They shall apply in all other localities unless the administrator or his representative shall fix a lower rate for particular localities.

36- and 40-hour weeks

IV. Employers shall not operate on a schedule of hours:

(a) On and after the effective date, for persons engaged in the processing of products of the electrical manufacturing industry, and in labor operations incident thereto, in excess of 36 hours per week.

(b) On and after September 1, 1933, for all other employees, except executive, administrative and supervisory employees and traveling salesmen, in excess of 40 hours per week.

Provided, however, that these limitations shall not apply to those branches of the electrical manufacturing industry in which seasonal or peak demand places an unusual and temporary burden for production upon such branches; in such cases no employee shall be permitted to work more than an aggregate of 144 hours per year in excess of the limitations hereinbefore provided, and provided, further, that such limitations shall not apply in cases of emergency. At the end of each calendar month every employer shall report to the supervisory agency, hereinafter provided for, in such detail as may be required the number of man hours worked in that month for emergency reasons, and the ratio which said emergency man hours bears to the total number of man hours of labor during said month.

V. National Electrical Manufacturers Association is hereby designated the agency for administering, supervising and promoting the performance of the provisions of this code by the members of the electrical manufacturing industry.

For the purpose of carrying out the provisions of the national industrial recovery act and complying with the spirit thereof every employer in the electrical manufacturing industry shall prepare and furnish to National Electrical Manufacturers Association not less than once in each year an earnings statement and balance sheet in a form approved by the board of governors or the executive committee of National Electrical Manufacturers Association or acceptable to any recognized stock exchange.

Statistics required

With a view to keeping the President of the United States and the administrator informed as to the observance or non-observance of this code, and as to whether the electrical manufacturing industry is taking appropriate steps to effectuate in all respects the declared policy of the national industrial recovery act, each employer shall prepare and file with such person or organization as the board of governors or the executive committee of National Electrical Manufacturers Association may designate and at such times and in such manner as may be prescribed statistics of plant capacity, volume of production, volume of sales in units and dollars, orders received, unfilled orders, stocks on hand, inventory, both raw and finished, number of persons employed, wage rates, earnings, hours of work, and such other data or information as the board of governors or the executive committee of National Electrical Manufacturers Association may from time to time require.

VI. Except as otherwise provided in the national industrial recovery act all statistical data filed in accordance with the provisions of Article V shall be confidential and the data of one employer shall not be revealed to any other employer except that for the purpose of administering or enforcing the provisions of this code, the board of governors or the executive committee of National Electrical Manufacturers Association, by their duly authorized representatives, shall have access to any and all statistical data that may be furnished in accordance with the provisions of this code.

VII. Any employer may participate in this code and in any revisions or additions thereto and receive the benefits thereof by accepting the proper pro rata share of the cost and responsibility of creating and administering it, either by becoming a member of National Electrical Manufacturers Association or by paying to it an amount equal to the dues from time to time provided to be paid by a member in like situation of National Electrical Manufacturers Association.

Cost-accounting system

VIII. Every employer shall use an accounting system which conforms to the principles of and is at least as detailed and complete as the uniform and standard method of accounting set forth in the sixth edition of the Manual of Accounting, prepared and published by the National Electrical Manufacturers Association, and a costing system which conforms to the principles of and is at least as detailed and complete as the standard and uniform method of costing to be formulated or approved by the board of governors or executive committee of National Electrical Manufacturers Association, with such variations therefrom as may be required by the individual conditions affecting any employer or group of employers and as may be approved by the board of governors or the executive committee of National Electrical Manufacturers Association or the supervisory agency and made supplements to the said Manual of Accounting or method of costing.

No sales below cost

IX. No employer shall sell or exchange any product of his manufacture at a price or upon such terms or conditions that will result in the customer paying for the goods received less than the cost to the seller, determined in accordance with the uniform and standard method of costing hereinabove prescribed, provided, however, that dropped lines, seconds, or inventories which must be converted into cash to meet emergency needs may be disposed of in such manner and on such terms and conditions as the supervisory agency may approve and as are necessary to move such product into buyers' hands, and provided further that selling below cost in order to meet existing competition on products of equivalent design, character, quality or specifications shall not be deemed a violation of this Article if provision therefore is made in supplemental codes hereafter prepared for any branch or subdivision of the industry.

X. If the supervisory agency determines that in any branch or subdivision of the electrical manufacturing industry it has been the generally recognized practice to sell a specified product on the basis of printed net price lists, or price lists with discount sheets, and fixed terms of payment which are distributed to the trade, each manufacturer of such product shall within ten days after notice of such determination file with the supervisory agency a net price list or a price list and discount sheet as the case may be individually prepared by him showing his current prices, or prices and discounts, and terms of payment, and the supervisory agency shall immediately send copies thereof to all known manufacturers of such specified product. Revised price lists with or without discount sheets may be filed from time to time thereafter with the supervisory agency by any manufacturer of such product, to become effective upon a date specified by the supervisory agency and copies thereof with notice of the effective date specified shall be immediately sent to all known manufacturers of such product, who thereupon may file, if they so desire, revisions of their price lists and/or discount sheets, which shall become effective upon the date when the revised price list or discount sheet first filed shall go into effect.

If the supervisory agency shall determine that in any branch or subdivision of the electrical manufacturing industry not now selling its product on the basis of price lists with or without discount sheets with fixed terms of payment the distribution or marketing conditions in said branch or subdivision are similar to or the same as the distribution or marketing conditions in a branch or subdivision of the industry where the use of price lists with or without discount sheets is well recognized, and that a system of selling on net price lists or price lists and discount sheets should be put into effect in such branch or subdivision, each manufacturer of the product or products of such branch or subdivision shall within twenty days after notice of such determination file with the supervisory agency net price lists or price lists and discount sheets as the supervisory agency may direct containing fixed terms of payment showing his prices and discounts and terms of payment, and such price lists and/or discount sheets and terms of payment may be revised in the manner hereinabove provided.

No employer shall sell directly or indirectly, by any means whatsoever, any product of the industry covered by the provisions of this article at a price lower or at discounts greater or on more favorable terms of payment than those provided in his current net price lists or price lists and discount sheets.

XI. Aggregations of employers having a common interest and common problems will be grouped by National Electrical

Manufacturers Association for administrative purposes in various subdivisions or product classifications.

Supervisor on each group

XII. In each subdivision or product classification there will be a supervisory agency approved or appointed by the board of governors or the executive committee of National Electrical Manufacturers Association. If formal complaint is made to National Electrical Manufacturers Association that the provisions of this code have been violated by any employer, the proper supervisory agency shall investigate the facts and to that end may cause such examination or audit to be made as may be deemed necessary.

XIII. The President may from time to time cancel or modify any order, approval, license, rule, or regulation issued under Title I of the national industrial recovery act.

XIV. Such of the provisions of this code as are not required by the national industrial recovery act to be included herein may, with the approval of the President of the United States, be modified or eliminated as changed circumstances or experience may indicate. This code is intended to be a basic code, and study of the trade practices of the electrical manufacturing industry will be continued by the board of governors of National Electrical Manufacturers Association with the intention of submitting from time to time additions to this code applicable to all employers in the electrical manufacturing industry and supplemental codes applicable to one or more branches or subdivisions or product classifications of the electrical manufacturing industry, such supplemental codes, however, to conform to and be consistent with the provisions of this code as now constituted or hereafter changed.

XV. If any employer of labor in the electrical manufacturing industry is also an employer of labor in any other industry, the provisions of this code shall apply to and affect only that part of his business which is included in the electrical manufacturing industry.

Very Dizzy, but Still Singing

The recovery merry-go-round continues to attract attention. The end of June found American business operating at the highest level in two years and yet business would be still better if it were not for the lure and the threat of NIRA that distracts attention from sales. Executives are becoming quite hesitant in courting NIRA and she is getting impatient and even resentful. Vague threats of shotgun weddings are heard out of NIRA headquarters.

What a world it is! Now comes the commodity dollar, the new securities law and the $3,000,000,000 construction program. Also come the thousands of job-seekers and money seekers to Washington —selfish interest is very dynamic. Slow action by administrative boards, therefore, may be the result of their knowledge that there will be a day of reckoning where results will mean political death or political survival.

Add to these items the usual alibis of the economists who are busy explaining how industrial recovery has gone on despite a great contraction in outstanding money and credit during the past three months. They say the discrepancy is explained by an increase in the rate of turnover of money and credit. We take it this means people either have become more willing to spend or have been frightened into spending.

Steel operations are abnormal when it is known that the railroads and the building industries are not buying. Textiles are working at a peak to fill shelves and are at an abnormal level. Security markets are booming because of the inflated dollar and a return of the gambling spirit that better business engenders. Utility outputs continue to mount. Manufacturers report better business in all electrical products with an imperative demand for quick deliveries. The summer slump is not yet in the dressing room and the administration appears ready to knock it out if it shows up in the circus. America is dancing and singing to the tune of the new deal.

New York Continues Investigations

THE legality of the Public Service Commission's investigation of the earnings of the New York Power & Light Corporation, to determine whether a reduction in electric rates is justified, was challenged by the corporation at the public hearing in Albany July 6.

After entering vigorous objections to the entire procedure, attorneys for the corporation succeeded in temporarily barring from the record a list of the corporation's officers and their salaries, which was offered in evidence by Col. Charles G. Blakeslee, counsel for the commission.

A statement prepared by the corporation was introduced at the afternoon session by Randall J. Le Boeuf, general counsel, showing a rate return of 5.19 per cent for the company's entire operations and pointing out that since January 1, 1933, rate reductions had become effective or had been filed with the commission affecting aggregate annual savings to the customers of $914,969.

The evidence placed in the record by Colonel Blakeslee showed the corporation earned a return of 7.27 per cent in 1932 and that a dividend of 42.61 per cent was declared last year on the stated value of its common stock. Earnings in 1931 produced a return of 7.90 per cent and in 1930 9.07 per cent.

Several emergency rate reductions in other electric corporations already have been ordered by the commission in the present state-wide proceedings and in each case the reduction was to a 6 per cent return.

Commissioner George R. Lunn presided at the hearing. Mr. Le Boeuf, at the opening of the hearing, requested the commission take judicial notice of a statement by Governor Lehman concerning the initiation of the state-wide proceedings by the commission.

"It is the contention of this company that this proceeding is illegal and unfair and a departure from proper procedure," Mr. Le Boeuf declared. "Therefore the statement by the Governor that he initiated this investigation has great significance."

Colonel Blakeslee offered in evidence a statement of the salaries of the corporation officers, supplied him by Mr. Le Boeuf.

"I object to the names of officers being subjected to publicity that serves no useful end and that invades their legitimate rights," Mr. Le Boeuf declared.

He said the commission had been given full information on officials' salaries, and that if it was necessary to have this information in the record he would provide tabulation of all salaries. He subsequently agreed to have the salary schedules marked for identification with the assurance they would be given no publicity pending a ruling.

From another quarter the question was raised whether evidence would be precluded concerning salaries of officials of the Ellenville Electric Company when that case was called. Commissioner Lunn ruled that a list of salaries for each company must be presented.

"My position," said Mr. Le Boeuf, "is that if the president of one company gets $20,000 in a rate case proceeding it is one thing, but whether his name is John Jones or something else has no bearing on this situation. I am going to object with all my strength to any publicity of this character."

The corporation's statement, presented by Mr. Le Boeuf, showed that for the electric department alone the return was computed to be 5.29 per cent and for the gas department alone 0.74 of 1 per cent.

The statement showed total fixed assets of $129,169,414.93. From this figure was deducted $522,032.73, representing contributions for extensions, and to the difference of $128,647,332.20 was added $2,490,211.63 for working capital, giving a total of $131,137,543.53. The company's operating income was computed to be $6,814,704.45 or 5.19 per cent of $131,137,543.83.

The other utilities at the day's investigation schedule included Central Hudson Gas & Electric Corporation, Corinth Electric Light & Power Company, Ellenville Electric Corporation, Fulton Light, Heat & Power Company, Harrisonville Electric Light & Power Company, Paul Smith's Electric Light & Power & Railroad Company and Peoples' Gas & Electric Company of Oswego.

Adjournment was taken to July 13.

Coming Meetings

National Electrical Wholesalers Association—Buffalo, N. Y., August 14-19. E. Donald Tolles, 165 Broadway, New York.

Illuminating Engineering Society—Delavan, Wis., August 28-31. D. W. Atwater, 29 West 39th St., New York.

International Association of Electrical Inspectors—Chicago, Ill., September 11-15, V. H. Tousley, 612 No. Michigan Avenue, Chicago.

National Electrical Exposition — New York, N. Y., September 20-30. Ralph Neumuller, 480 Lexington Ave., New York.

National Association of Railroad and Utilities Commissioners — Cincinnati, Ohio, October 10-13. James B. Walker, 270 Madison Ave., New York.

Association of Iron and Steel Electrical Engineers—Pittsburgh, Pa., October 17-19. John F. Kelly, Empire Building, Pittsburgh.

▼

To Discuss Problems of Utility Control

The National Association of Railroad and Utilities Commissioners will hold its annual convention at Cincinnati, Ohio, October 10-13. At a meeting of the executive committee in Chicago, July 3, the following subjects were selected for special discussion at the convention:

To what extent, if any, is Federal regulation of motor carriers necessary in the public interest?

Establishment of public utility rates by negotiation.

What amendments, if any, in the interest of state regulation, should be made in the classification of accounts for telephone companies promulgated by the Interstate Commerce Commission November 12, 1932?

Holding and affiliated companies and the problems they present.

To what extent, if any, should reduction in operating costs of railroads be attempted through reductions of station facilities and of passenger trains operated?

▼

Government Seeks Lower Utility Rates

As the result of a demand by officials of the War Department for a 10 per cent reduction in rates charged for electricity, gas and water at federal government properties in Massachusetts, the State Department of Public Utilities on June 30 summoned the officials of six public utilities companies to appear before the Department July 5 to discuss the propriety of the rates.

So far as can be ascertained, this is the first time that the department has received a request from the federal government for a reduction in the rates of utilities companies. The companies which have been requested to appear at the hearing are the New Bedford Gas & Edison Light Company, furnishing electricity and gas at Fort Rodman; Edison Electric Illuminating Company of Boston, furnishing electricity at the Army Base, Boston, the Boston Airport and the Watertown Arsenal; Lynn Gas & Electric Company, furnishing electricity at Fort Ruckman, Nahant; Suburban Gas & Electric Company, furnishing electricity and gas in the vicinity of Winthrop; United Electric Light Company, furnishing electricity at the United States Arsenal, Springfield; Hingham Water Company, furnishing water in the vicinity of Hull.

▼

Conference of State Utility Commission Engineers

The eleventh annual conference of State Utility Commission Engineers was held at the bureau on June 1-3, 1933, inclusive. Twenty-four engineers, representing twelve states, the District of Columbia and the Province of Ontario, Canada, were present.

The following papers and written discussions were presented:

"The Grounding of Electric Circuits," A. G. Mott, Railroad Commission," San Francisco.

"Limitations of Voltages in Joint Use of Poles," J. K. Pettengill, Public Service Commission, Lansing, Mich.

"Contacts of the Airways Division, Department of Commerce, with Public Utility Companies," F. C. Hingsburg, Airways Division, Bureau of Lighthouses, Department of Commerce, Washington, D. C.

"Grade-Crossing Classification and Protection," E. I. Rudd, Public Utilities Commission, Hartford, Conn.

"Determination of Billing Demand," C. B. Hayden, Public Service Commission, Madison, Wis.

Transportation by Motor Vehicle—"Rules and Regulations for Transportation by Bus," H. C. Eddy, Board of Public Utility Commissioners, Newark, N. J. "Truck and Bus Regulations," J. Houston Johnston, Public Service Commission, Atlanta, Ga. "The Open Road," R. H. Nexsen, Public Service Commission, New York, N. Y. "Taxicab Regulations," F. A. Sager, Public Utilities Commission, District of Columbia.

"Line Extension Policies," Harry Barker, Public Service Commission, Montpelier, Vt.

"Relation of Underground Corrosion Data to Pipe-Line Economies," K. H. Logan, Bureau of Standards, Washington, D. C.

"Maximum Demand Meter Approvals," R. H. Nexsen, Public Service Commission, New York, N. Y.

Copies of the papers and discussions are obtainable only from the authors, to whom application should be made.

An executive committee to prepare for next year's conference was elected.

Commission Wins on Utility Bonds

The Public Service Commission's refusal to permit the Staten Island Edison Corporation to issue $8,500,000 first mortgage gold bonds to meet obligations previously incurred has been upheld by the Appellate Division, Third Department. The ruling was not unanimous and an appeal to the Court of Appeals is possible.

According to W. T. Wilkinson, examiner for the commission, the Public Service Commission is now armed with increased power of supervision over financial structures of public utilities.

The bonds which the Staten Island Edison Corporation wished to float were to be sold at not less than 85 per cent of par and accrued interest and the amount received, estimated at $7,225,000, was to be used for the payment at maturity of $7,500,000 face amount of one-year 3 per cent notes.

Previously the company had issued notes of $7,500,000 face value. These being for less than a year, no permission from the commission was necessary.

The commission in denying the company's application pointed out that the action "was taken to avoid the necessity of such approval and the period of issue was the maximum permitted by law without approval."

A commission examiner, declaring that the notes were used to buy Associated Electric Company bonds, said that "the purchase by the Staten Island company of the securities of its affiliated holding companies is questionable in general as to the price paid in particular."

"The transaction appears inimical to the public concept of the holding company, the financing of the subsidiary operating company, and appears unwarranted in view of the holdings by the Associated Electric Company and Mohawk Valley Company and affiliated holding and finance corporations, as evidenced," he added.

The commission gave two hearings on the applications.

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Doherty Quits Selling in W. Virginia

Declining to comply in full with new state security regulations, the Henry L. Doherty Company, which sells Cities Service Company securities, has withdrawn its application for a new license to do business in West Virginia. Announcing that the Doherty company will cease business in the state, for the present at least, Harold K. Bradford, Deputy Securities Commissioner, said representatives had asked him to liberalize the restrictions and he had refused.

Securities Rules Issued by Federal Trade Commission

Rules and regulations to carry out the new federal securities act for the protection of American investors against worthless stock issues were made public by the Federal Trade Commission last week and will apply to all stock offerings sold after July 27.

Under the new law security underwriters must file with the commission full particulars before they can sell new stocks and bonds. Registration statements containing details must be furnished to the commission and remain on file for twenty days before the stock may be sold under the act. Expert accountants of the commission will study the statements and make a report, after which the commission may order the proposed issue withheld from sale or permit it to be offered to the public.

Registration statements will be open to public inspection at the commission and will also be furnished in duplicate at a nominal sum. Thus the prospective investor may see the detailed information required relating to the issuing company, its offices, names of principal stockholders and all other facts. Any prospectus issued by those offering the securities must be filed with the registration statement. Along with the rules and regulations the commission made public the registration statement which stock issuers will be required to fill out. The registration questionnaires call for a mass of technical information, closely following the demands made under Schedule A of the securities act. For instance, some of the law's requirements are:

Names and addresses of all persons owning more than 10 per cent of any class stock of the security issuer.

Remuneration exceeding $25,000 paid by the stock issuer during the past year to directors and officers.

The estimated net proceeds to be derived from the security.

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Favorable Report on Seattle Municipal Plant

According to a report of Ford, Bacon & Davis, Inc., valuation engineers employed by the Seattle City Council to make a survey of the City Light Department's physical properties, the system has a value of $37,152,500, without its new Diablo development on the Skagit River, which cannot be brought into service until an additional expenditure of about $4,000,000 has been made. The figure is based on the probable cost of reproduction, less depreciation. The firm's report will be used in efforts started several months ago to get money to retire about $1,854,000 in outstanding City Light warrants and to complete the Diablo power house. When the Diablo development has been put in operation the engineers calculate the "value in use" of the department's system will have reached $44,077,649.

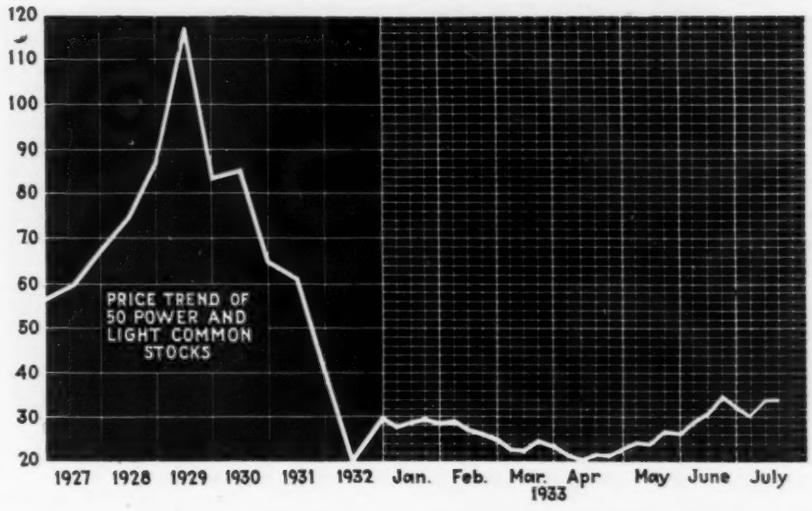
J. D. Ross, superintendent of City Light, has been in the east for two months endeavoring to get federal and private money on City Light bonds to complete the Diablo work and $18,500,000 in addition to that to proceed with Ruby Dam and flood-control project on the Upper Skagit, after Diablo has been completed. Mr. Ross has been authorized by the Council to switch his negotiations from the Reconstruction Finance Corporation to the new administrator of the federal recovery act.

The report of Ford, Bacon & Davis, Inc., highly commends the City Light, particularly as to its management. It declares "there is no evidence of machine politics and no indication of appointments to important positions of inefficient employees based upon political influence."

Reduced activities, due to the depression, have been largely taken care of without discharging employees by rotation of labor, the report points out.

"The department operates with smaller overhead costs than many, if not most, privately owned utilities of the same character and corresponding magnitude," the report declares. "The books of the department appear to reflect its operation correctly and fairly, with administration all charged to operating expenses. That portion of engineering, drafting, accounting, etc., charged to capital accounts is reasonable and in some cases even unnecessarily low. Property retired or replaced is properly written off, the undepreciated portion being charged to profit and loss, with labor of removal charged to operation. Unit book costs of such items as can be readily measured and computed are low, reflecting low overheads."

Stock Prices Again Advance



Utility stocks continued to advance during the past week. Price changes were sufficient to carry the "Electrical World" index up to 34.1, as compared with 33.6 for the preceding week.

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Milton Trust Has United Founders

Dominating interest in the United Founders Corporation has been acquired by the Equity Corporation and its associates under the direction of David M. Milton, son-in-law of John D. Rockefeller, Jr. Although the net value of its assets have shrunk to only slightly more than one-tenth of its pre-depression size, United Founders is still one of the largest companies of its type. One of its principal holdings is a controlling interest in the United States Electric Power Corporation, which ,at the time of acquisition in 1931, had total assets of $1,200,000,000. This company in turn controls the Standard Gas & Electric group. The new arrangement does not involve absolute control of the company, but representatives of the Equity Corporation will go on the board of United. Louis H. Seagraves will remain as president of United.

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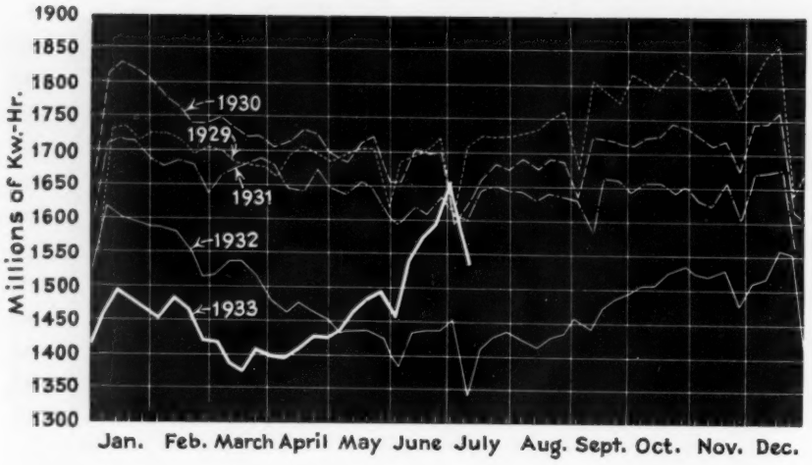
To Probe Utility Service Charges

Under an order adopted by the Senate the possibility and expedience of prohibiting service charges in domestic consumption of electricity and gas will be investigated by the Massachusetts Department of Public Utilities.

Gains Continue in Holiday Week



Independence Day, as usual, brought a decrease in the week's energy output; the excess over 1932, however, continued to mount, rising to 14.7 per cent compared with 13.7 per cent the week before. Production in the week ended July 8 was 1,538,500,000 kw.-hr., according to the Edison Electric Institute. This brings it within 3.5 per cent of the figure for the holiday week of 1930.

Some of the regional gains are extraordinary. In the Southern States last year's output was surpassed by 29.1 per cent, in New England by 22.2 and in the Midwest by 16.2 per cent. On the Pacific Coast the change from the previous week's loss to a small gain brings every region above 1932.

Weekly Output, Millions of Kw.-Hr.

Week ended	1933	1932	1931	1930
July 8.....	1,539	1,342	1,604	1,626
July 1.....	1,656	1,457	*1,607	*1,594
June 24.....	1,598	1,441	1,635	1,704
June 17.....	1,578	1,442	1,610	1,698
June 10.....	1,542	1,435	1,621	1,707

*Includes July 4 holiday

Per Cent Change from Previous Year

Region	Week Ended July 8	July 1	June 24
New England.....	+22.2	+20.9	+19.2
Middle Atlantic....	+11.3	+11.1	+8.9
Central industrial..	+16.2	+17.6	+13.9
Southern States....	+29.1	+17.1	+13.8
Pacific Coast.....	+0.2	—0.3	—0.6
United States.....	+14.7	+13.7	+10.9

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Capital Goods Institute Has Been Formed

As a result of several weeks of preliminary discussion, there has been formed the Machinery and Allied Products Institute, to serve as a co-ordinating agency among many groups of machinery builders and producers of machine supplies and other types of capital goods. The preliminary plans for the new organization were made at a meeting in New York on June 23, presided over by Harry C. Beaver, president of the Worthington Pump & Machinery Corporation.

As discussion among the sixty-odd representatives of the various machinery and allied industries present developed a general sympathy with the idea of an institute to co-ordinate the interests of existing trade associations and those yet to be formed an organization committee was appointed under the chairmanship of George Houston, president of the Baldwin Locomotive Works, and a finance committee under the chairmanship of Col. Robert H. Morse of Fairbanks Morse & Company. John W. O'Leary of Chicago, for many years active in manufacturing, engineering and finance, a past-president of the United States Chamber of Commerce, of the National Metal Trades Association and of the Chicago Association of Commerce and president of Arthur J. O'Leary & Son Company, makers of drop forgings, has been elected to head the new institute and is working with the committees appointed at the New York meeting toward the completion of the organization.

The exact scope of the institute's activities has not yet been announced and it is not known whether an attempt will be made to formulate a single code for presentation to the National Recovery Administration or whether the institute will confine itself to trying to co-ordinate the codes of its member groups, but it has been definitely determined that the new body will take the form of a federation, and that membership will be open to trade associations only, not to individual corporations.

Among the special groups represented by executives of leading companies at the New York meeting were the makers of machine tools, of textile machinery, of road-building machinery, of mining machinery, of twist drills, of food packaging machinery, of dairy machinery, of belting, of scales, and of engines and pneumatic and hydraulic equipment of all types. Definitely excluded from the field of interest by agreement, however, is the manufacturer of railroad and marine equipment.

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Illinois Sales Tax in Dispute

With Illinois' 2-cent retailers' occupational tax in effect since July 1, a ruling by the State Department of Finance will determine whether or not the tax applies to retail sales of electricity. Should the department rule in the affirmative, the Illinois Supreme Court may be called upon to determine whether or not electricity is tangible personal property.

Settlement of the question hinges on interpretation of special rule No. 2 of the Finance Department, relative to the tax. The rule reads:

Property, things and substances embraced within the term "tangible personal property." The term embraces personal property known as tangibles as opposed to that class of personal property falling within the conception of intangibles. Tangibles consist of things or substances that may be touched, felt, observed; that are perceptible, palpable, capable of being possessed or realized; tactile, readily apprehensible by the mind; real, substantial, evident; and consist of substances that may be taken out of the ground and reduced to possession and conveyed by pipe lines or other means, measured and sold, and similar substances that may be produced mechanically, chemically or otherwise and so conveyed and sold.

Intangibles consist of shares of stock, bonds, corporate and other franchises, evidences of interest in property, evidences of indebtedness and such like. Thus, the term "tangible personal property" embraces all goods, wares, merchandise and commodities.

The new 2-cent tax replaces the 3-cent one held invalid by the state Supreme Court a month after it was enacted. The objections of the original act were met by omitting exemptions, except "isolated or occasional" sale of farm products.

The new tax, which is expected to bring in $35,000,000 to $40,000,000 a year, will go for unemployment relief until January 1, when it will be used to wipe out the state property tax of 50 cents on each $100 valuation.

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Preferred Dividends Deferred

Birmingham Electric Company has deferred payment of dividend to preferred-stock holders until such time as business conditions warrant, according to a statement by the president, J. S. Pevear. Dividends on preferred stock are cumulative and no common-stock dividends can be paid until all back preferred dividends have been met in full.

Electrical Wholesalers Drafting Code

The National Electrical Wholesalers Association, New York City, has announced that its national code committee of twelve members met in New York July 11 and 12 to draft a code of practices for that branch of the electrical industry.

The members of the committee are: H. J. Baitinger, president Baitinger Electric Company, Inc., New York. W. I. Bickford, secretary and treasurer Iron City Electric Company, Pittsburgh. J. L. Buchanan, president General Electric Supply Corporation. B. W. Clark, general manager Westinghouse Electric Supply Company. G. E. Cullinan, vice-president Graybar Electric Company, Inc. F. R. Eisemann, secretary and treasurer Revere Electric Company, Chicago. F. R. Elliott, president Elliott-Lewis Electrical Company, Inc., Philadelphia. E. M. Graham, vice-president National Electrical Supply Company, Washington. N. W. Graham, president Graham-Reynolds Electric Company, Los Angeles. Arch McKay, president McNaughton-McKay Electric Company, Detroit. R. L. Simon, president Metropolitan Electrical Distributers, Inc., New York. G. H. Wahn, president George H. Wahn Company, Boston.

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National Industry-Wide Lighting Activity to Be Launched

THE Edison Electric Institute has designated this fall as the opportune time to develop local lighting drives backed by national co-operation. The first activity of the special committee formed by the Edison Electric Institute is to be directed to lighting. Chairman George E. Whitwell of the sales committee has appointed a special committee consisting of M. E. Skinner, chairman; H. F. Barnes, General Electric Company; J. F. O'Brien, Westinghouse Lamp Company, and C. E. Greenwood, director of the commercial department at institute headquarters, where details of operation will be carried on.

A lighting program to recover lost revenue and overcome the thrift complex for saving on light was suggested by George E. Whitwell, vice-president Philadelphia Electric Company, in his address at the convention of the institute at Chicago. The idea had the general indorsement of the sales committee.

In a series of circulars, letters and other direct-mail methods of stimulation the utilities, together with lamp and lighting equipment companies, will be mobilized for local activities. Mr. Whitwell says: "This is not to be regarded as a campaign. It is a program with national stimulation to effect local co-operative action."

George B. Cortelyou, president of the Edison Electric Institute, in a letter to executives of utility company members states:

> Revenue from lighting service for a number of months has been appreciably affected by the reduced use of lighting. It is believed that this curtailment has reached the point where it is as injurious to the welfare of our customers as it is prejudicial to company revenues.
>
> The sales committee of the Edison Electric Institute, with the approval of the operating committee, proposes that during the months of October and November of this year the sales efforts of electric light and power companies be directed toward recovering this lighting load. The sales committee plans to coordinate its program with the sales efforts of the manufacturers of lamps and lighting equipment. Steps toward that end are already in progress.
>
> I feel that we should all be strongly impressed by this proposal of the sales committee, because the present appears to be an opportune time to focus the attention of the industry on this potential field for immediate increase in revenue.

All branches of the electrical industry have been invited to participate and assist locally in setting up a plan of procedure to further the cause of good lighting in their respective communities and also trade organizations interested in the merchandising of lamps or lighting equipment. It was emphasized that although the activity is planned on a national basis, it is intended for local development and execution. Lamp and fixture manufacturers who advertise nationally will tie in their advertising with the activity during October and November. However, the major advertising and sales promotion will come from local groups, in which the utility, manufacturer, jobber, retailer, electric leagues and others will plan their drives to fit their own conditions.

The advertising themes will be built around the slogan: "Better Light—Better Sight."

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Insull Auction Postponed

Auction of securities pledged with four New York banks by Insull Utility Investments and Corporation Securities Company of Chicago, scheduled to be held last week, has been adjourned until August 2.

Major New Construction This Week

Motors, controls, air compressors, electric pumping machinery, etc., will be installed for $200,000 expansion program at oil and gasoline refineries of Shamrock Oil & Gas Company, Amarillo, Tex., in Panhandle district and near Lefors, Tex.

Norton Brewing Company, Anderson, Ind., authorized expansion and improvements to cost about $200,000.

Until August 18, Bureau of Reclamation, Denver, Colo., asks bids for two or four 82,500-kva. generators and for one 40,000-kva. generator, vertical shaft, a.c., each unit complete with main exciter, pilot exciter, thrust and guide bearings, etc., for hydro-electric power plant, Boulder Canyon Project, Nev. (Specification 543).

Thief River Falls, Minn., asks bids until July 25 for Diesel engine unit for city-owned power plant.

Motors, controls, conveyors, etc., will be installed in new addition to plant of Hookless Fastener Company, Meadville, Pa. Estimated cost $200,000.

Danville, Va., is arranging financing for $2,500,000 for city-owned hydro-electric power plant on Dan River, including transmission lines, switching and power substations for service to several neighboring communities.

Akron Brewing Company, Akron, Ohio, recently organized, approved plans for new plant to cost about $300,000.

Bids will soon be asked by State Architect, George B. McDougall, Sacramento, Calif., for power plant at new state institution at Camarillo, Calif.

Sebewaing Brewing Company, Sebewaing, Mich., has approved plans for remodeling and expansion, including installation of equipment. Cost about $150,000.

Fund of $250,000 is being arranged by Signal Hill, Calif., for city-owned electric light and power plant.

Motors, controls, electric ice-making and refrigerating equipment, hoists, conveyors, etc., will be installed in new ice-manufacturing plant of Consumers Company, Aurora, Ill., to replace unit recently destroyed by fire. Cost about $100,000.

Board of Public Works of Fort Wayne, Ind., will receive bids to June 25 for the following electrical equipment to be used in the municipal pumping station. Switching equipment, transformers, motor-starting equipment for both two-speed and constant-speed motors, motor and generator control panels, automatic control equipment for 250-hp. generator, emergency lighting unit of batteries and charger, valve control equipment, lighting fixtures and cabinet, a complete system of wiring in conduit.

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New York Metal Prices

	July 5, 1933 Cents per Pound	July 11, 1933 Cents per Pound
Copper, electrolytic	8.50	9.00
Lead, Am. S. & R. price	4.30	4.50
Antimony	6.50	6.75
Nickel ingot	35.00	35.00
Zinc, spot	4.95	5.20
Tin, Straits	47.00	47.00
Aluminum, 99 per cent	23.30	23.30

As to Rates——

• Announcement has been made by the New Jersey Board of Public Utilities Commissioners that an inquiry into the fairness of rates charged by the Public Service Electric & Gas Company will be held during the first week of August. While numerous complaints have been made that the rates are excessive, the hearing will be based upon one by George Hubschmitt of Newark, who asks that a reduction of 20 per cent be made effective. This complaint charges that earnings of the company have exceeded 9 per cent on its investment, notwithstanding that the courts have held that 7 per cent represents a fair return.

• Members of the Philadelphia County Medical Society have filed a formal protest with the Public Service Commission against the commercial rate being charged by the Philadelphia Electric Company to physicians and dentists. A letter also was sent to Governor Pinchot requesting his co-operation in maintaining the protest against what is considered by the protesting group an unfair and unwarranted overcharge. Physicians maintaining offices in their homes have received from 20 to 40 per cent increases in their billings according to members of the Medical Economics Committee, headed by Dr. George C. Yeager. Under the current tariff, it is stated, the commercial rate is charged for all illumination and electrical household equipment used in a dwelling in which a doctor's or dentist's office is maintained, even though only one piece or none of professional equipment is in use in a subrented office. Dr. Yeager estimates that of 1,500 members of the County Medical Society, 75 per cent practice in their own homes and 90 per cent of these use only illumination. Spokesmen for the electric company, defending the rate that the physicians complain of as oppressive and discriminatory, say that unless all physicians and dentists are charged the same rate those who practice offices apart from their homes suffer discrimination.

• Discussion of property values was forbidden again by Milo B. Maltbie, chairman of the New York Public Service Commission at the hearing resumed last week on metropolitan utility rates. Mr. Maltbie held that such a procedure would make temporary rates impossible and prevent permanent rate reductions for several years.

• After lengthy negotiations between City Council and officials of the Columbus Railway, Power & Light Company, Columbus, Ohio (ELECTRICAL WORLD, June 17, page 785), a reduction in electric light rates, ranging from 6⅞ per cent to 8⅛ per cent has been offered the city by B. W. Marr, president of the company. The reduction proposal was contained in two alternate schedules submitted at a conference between Mr. Marr and members of the City Council subcommittee appointed to negotiate with the company on the city's demand for a reduction. Schedule No. 1 would mean annual reduction of $138,575 and Schedule No. 2 would mean a reduction of $166,590. Persons consuming 10 kw.-hr. or less a month would receive no reduction under Schedule No. 1. Consumers using 25 kw.-hr. or less would get no cut under Schedule No. 2. But only 5 per cent of the total number of customers would fall in the 10-kw. class. The savings on the average home owner's bill would be 20 cents a month, or $2.40 a year, under the first schedule, and 25 cents a month, or $3 per year under the second. A cut of $2.40 per year would be 6⅞ per cent and $3 would be 8⅛ per cent.

• At a hearing before the Illinois Commerce Commission an offer to reduce its electric light rates in the 387 communities it serves was made last week by the Illinois Power & Light Corporation. Consideration was postponed after J. E. Johnson, vice-president, said the reductions would range from 7 to 20 per cent, averaging about 10 per cent. Among the cities which would be affected are Cairo, Mount Vernon, Jacksonville, Galesburg, Marseilles, Champaign, Urbana and Danville. City authorities of Belleville have flatly refused an offer of the corporation to reduce rates to the consumers from 10 to 12.5 per cent. "The Illinois Commerce Commission," Mayor George A. Brechnitz said, "upon request of the city of Belleville, has ordered an investigation into rates of power, light, water and gas companies. To accept this compromise would shut off information that the public wants to know."

• A bill increasing the power of the Illinois Commerce Commission in regard to lowering public utility rates has been passed by the Legislature and signed by Governor Horner.

• After careful analysis the Public Utilities Commission of Connecticut has sustained the rate schedule applicable to electric service filed with it by the Northern Connecticut Power Company in conformity with an order issued by that body last May (ELECTRICAL WORLD, May 20, page 632). The new schedule, which will effect a reduction of approximately $35,047 in the company's operating revenues for the year 1933, will affect about 90 per cent of all electric customers, except municipalities. A comparison of the new schedule of rates with the corresponding rates which were before the commission in the hearing shows that the changes in the residential rates consist of modifications of the flat, area and energy charges. The commission, in its order, based upon the figures and estimates presented at the hearing, allowed a rate of return for the company as a whole of 6.5 per cent upon the found fair value of $3,200,000. The new schedule became effective with all bills for electric service based upon regular meter readings taken on and after July 1, 1933.

• New schedule of reduced electric rates of the Orange & Rockland Electric Company, which will save consumers in Orange and Rockland counties more than $48,000 a year, has been approved by New York Public Service Commission. The new schedule, effective as of July 1, reduces the number and complexity of the present rates and constitutes a considerable improvement over the present rate structure of the company, which has had numerous optional rates and special contracts which will be eliminated under the new schedule.

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Municipal Plant Items

AT MONTEBELLO, CALIF.—City Council has created by ordinance a municipal light and power commission to work in connection with the special $125,000 municipal light and power bond election to be held August 1. The Council several months ago prepared to spend $30,000 for a light and power plant that would supply electric energy for street-lighting purposes only. Since that time, however, the Council has decided to carry forward plans for a municipal distributing plant and supply electricity for the entire city.

AT ROCKFORD, IOWA—The city of Rockford has awarded a contract for the construction of and equipment for a municipal light and power plant to Fairbanks, Morse & Company, Chicago, Ill., at $82,111. Plans for the improvement call for a one-story concrete and tile building 40x60 ft., generating units of 500 hp. capacity, switchboard, auxiliary equipment and a complete distribution system.

AT ANDERSON, IND.—The last tract of mortgage indebtedness against the municipal light plant here was wiped out when the city paid and retired $11,300 of bonds. They were the last of a series issued in 1921, at which time the plant was rehabilitated and built practically new and larger.

AT BROWNSBURG, IND.—Officials of Brownsburg recently visited Williamsport, Ind., to inspect the municipal light plant there. Brownsburg is expecting to open a drive for a municipal plant shortly.

AT MATTOON, ILL.—A movement toward municipal ownership of a light and power plant and extension of the water works system to supply domestic consumers was apparently killed when City Attorney A. L. Berkowitz ruled that a proposed city ordinance to abolish the present city water board and to create a new board would be illegal.

AT CAPE GIRARDEAU, MO.—A movement for municipal ownership of an electric light and power plant has been launched by a group of citizens headed by E. L. McClintock. The proposal has been informally presented to the City Council with a request that the city retain a competent engineer to conduct a thorough survey to ascertain the power requirements of the municipality. The Missouri Utilities Company, which furnishes light and power in Cape Girardeau, has requested a new twenty-year franchise and a franchise bill is now pending before the Council. The present franchise, granted in 1913, expires on November 5, 1933. It is estimated that during 1931 residents of Cape Girardeau used 5,366,140 kw.-hr. of electricity, for which they paid $249,636.77. Municipal ownership proponents estimated that a city-owned plant would produce a net profit of from $60,000 to $80,000 annually and pay for itself within a very few years.

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Lewiston Hydro Costs Fixed

A decision fixing the legitimate original cost of the so-called Lewiston hydro-electric development near Lewiston, Idaho, at $3,185,260 and disallowing claims for an additional $387,366 was announced July 10 by the Federal Power Commission. The project is licensed to the Chelan Electric Company.

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Columbia Basin Next

The Columbia River project is now under way to outdo the Tennessee Valley. The state unemployment relief commission has allocated $377,000 to the Columbia Basin Commission. A contract was then drawn with the government Reclamation Service to do preliminary engineering work on the Grand Coulee dam to a total of $377,000. Senator Dill expects to go to Washington to set machinery to work to get funds for the $60,000,000 project and reports his oral assurance that the money will be made available. It is hoped to start dam construction next year.

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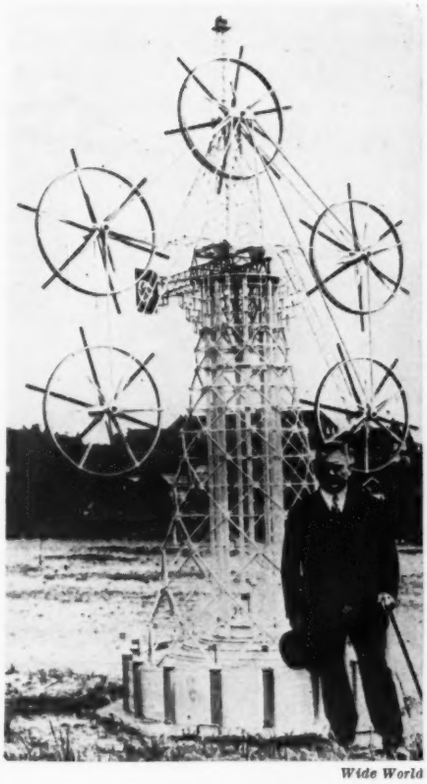
New Tulsa Electric Franchise

A new 25-year electric franchise was voted the Public Service Company of Oklahoma, subsidiary of Central & South West Utilities Company, in a municipal election at Tulsa. By a close vote the electorate approved the new franchise, which provides payment to the city of 2 per cent of annual gross revenues by the company. It is estimated Tulsa will receive a minimum of $50,000 a year, as against $15,000 heretofore.

German Wind-Power on Grandiose Scale



Wide World

Herman Honnef conceives a 1,620-ft. structure with 480-ft. wheels to drive five 25,000-kw. turbines. Above is a 15-ft. model of the high-zone wind-power station

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Advertising Association Makes Awards

Winners in the annual "Better Copy" contest of the Public Utilities Advertising Association for the best advertisements of the year 1932 were announced by F. W. Crone of New York, chairman of the better copy committee, at the association's annual convention in Grand Rapids on June 27. More than one hundred utility companies submitted nearly one thousand pieces of copy for the contest. Among the judges were Bruce Barton, H. K. McCann and Earle Pearson. First prize in the electric newspaper advertising division went to the Boston Edison Company; first prize in the electric window display division was awarded to the Buffalo General Electric Company; the Arkansas Power & Light Company was the winner of the first prize in the general utility advertising division and the Nebraska Power Company in the campaign advertising division. Officers of the association elected at the convention include: E. Frank Gardiner, Midland United Company, president; Henry Obermeyer, Consolidated Gas Company of New York; J. R. Pershall, Public Service Company of Northern Illinois, Donald D. Parry, Central Hudson Gas & Electric Corporation, vice-presidents; Eric W. Swift, Commonwealth Edison Company, secretary, and Howard F. Weeks, Consolidated Gas Company of New York, treasurer.

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200-Kilocycle Piezo Oscillation

Research Paper No. 576, which will appear in the July number of the Bureau of Standards Journal of Research, describes a piezo oscillator which is used to control the frequency of the standard frequency transmitter of the bureau.

The piezo-electric element is a Curie or zero-cut quartz plate having a fundamental frequency of 200 kilocycles per second. The mounting is a clamped type which maintains the quartz plate in a fixed position between the electrodes without introducing an excessive amount of damping.

The oscillator circuit arrangement is of the conventional type in which the quartz plate is connected between the grid and filament of a UX112A tube. An untuned inductance load is connected in the plate circuit. There are two coupling amplifiers which are connected in cascade. The first is a UX222 tube which is connected to the oscillator plate impedance through a small condenser and a voltage divider arrangement. The second amplifier is a UX112A tube.

The temperature control consists of two thermostatically controlled compartments, one within the other. The quartz plate has a double temperature control, while the oscillator and amplifier circuit arrangements are within the outer control only.

The piezo oscillator described has been in use for a year. During this time its frequency in terms of the primary frequency standard has changed less than 1.5 parts in 10^8. The frequency is constant within a few parts in 10^9 for several hours.

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Electric Utilities Limit Extended

Robert W. Rea, chairman of the committee representing holders of Electric Public Utilities Company fifteen-year 6 per cent bonds, due in 1942, announced last week that the time limit for deposits under the reorganization plan had been extended until July 25. The trustee has given notice that he will offer for sale on July 27 all collateral securing the bonds, which the committee expects to acquire at the sale (ELECTRICAL WORLD, July 8, page 40).

EDITORIALS

L.W.W.MORROW
Editor

A return to David Harum

A VETERAN business man remarked, "We venture to guess that a great many utility engineers, utility executives and utility salesmen would, were they suddenly plunged into the maelstrom of manufacturing, find that they had been traveling at a slow pace and it would seem as if they had entered a new world in which there might be difficulty in holding their places did they not accelerate their pace over that they had smugly maintained in the utility field. They would also find that they had to do what was expected with a great deal less money, fewer conveniences and less assistance than they enjoyed in the utility business. I have been in both business activities and know what I am talking about from experience."

This raises some interesting suggestions. For example, suppose a utility engineer on a substation job had to compete with other engineers for the work? Could more money be saved by having internal utility engineering competition on work than by executive orders to spend no money? At least wits would be sharpened and more action would be had by internal competition.

Suppose a utility sales executive had to bid for a service territory against ten or a dozen other utility companies. Suppose the community said: "Utility A is 20 per cent under you, don't you wish to change your quotation?" We venture to predict that if this competition existed utility executives would long for a return of the good old days of present Public Service Commission protection.

The point we wish to make is that it is time for utilities to become aggressive and hard boiled. Their protective coat as a monopoly is full of holes and well worn and the commission armor is badly dented. More and more they must depend upon service quality and service cost to survive upon business merit. Money and man power must be expended intelligently and the old days of supplying a demand business have passed. In every aspect of the business there is need for new ideas, aggressive and prompt action and a realization that this is a very competitive business that will survive only in the degree it earns its position.

Develop an industry code

ANY code for the electrical industry under NIRA should seek to rectify major maladjustments. In the electrical industry these are in distribution, and any code developed should be made jointly by manufacturers, wholesalers and retailers after full and complete discussion. To rectify conditions it will be necessary to state the channels of sale for each product, the margins, the prices and the field of activity for manufacturer, wholesaler and retailer. Statistics of stocks and of sales by each agency are just as essential as statistics of production.

Any plan developed by manufacturers alone will accomplish little unless full consideration is given to the chaotic distribution problem. After all, price cutting and bad business practices occur by reason of efforts to take short cuts or to avoid intermediaries in an attempt to get goods to consumers. It is direct selling, by-passing of wholesalers and retailers and lack of knowledge of costs of selling that create chaos in the electrical industry. It is the lack of application of principles of selective marketing and multiple selling that creates waste and bad business practices.

Thus NIRA offers an opportunity to force manufacturer, wholesaler and retailer to behave and to become wise. And if the ablest leaders of each group will get together and develop a code that will do this they will have made a valuable contribution to the industry. A selfish and incomplete code developed and presented by each group alone should not go to Washington. If time is not available for a joint code, at least provision should be made to correlate the codes and to set up a definite joint agency to do this.

Shortsightedness on values

PRIOR to this depression it was recognized that some businesses inherently held more risks than others and that the greater the risk the more an industry paid for its capital. This meant that the price paid by the public for products or services was least in a business in which capital risk was a minimum. The light and power business was conducted upon this principle, earned this credit position, and the public benefited.

So far as the light and power industry is concerned, state and governmental agencies seem to have forgotten this principle which was in the public interest. They seem bent upon undermining the credit position of an essential industry and thus forcing increased rates upon the public. The Administration is reported as favoring loans to municipalities to construct and own their own utilities. It has gone far in establishing uneconomic competitive enterprises on the Tennessee, Columbia and Colorado rivers. It continues to draw headlines by the one-sided presentations before the Federal Trade Commission. And the state commissions with one hand advocate rate reductions and a 6 per cent return, while with the other they demand an increase in depreciation reserves and in service facilities.

Surely logic points to the fact that taxpayers and ratepayers are identical and that these moves to undermine utility credit are both ill-advised and expensive. The public will pay the ultimate bill, and in the meantime will suffer because of the credit and service handicaps placed upon the business. Is it not enough to make utilities collect and pay taxes to the extent of a quarter of their gross income without carrying on a punitive campaign against utility credit? Low rates, expansion, increased service—these follow low cost capital. Leaders of public sentiment should have a saner perspective and a clearer view on values and stop killing the confidence of investors who grant the money to make electric service possible.

Refurbish factory lighting

IMPROVING business and shortening days are setting the stage for a systematic attack on inadequate factory lighting this summer by progressive central stations, contractors and consultants. Some of the larger textile mills in New England have had extensive surveys made and authorizations are reported to be close at hand for some important improvements in illumination before fall. All branches of the electrical industry benefit from such work as this, and, moreover, the user of better lighting profits most of all. The marked trend toward re-employment of factory labor, existence of 24-hour production in some mills and pressure of authorities to improve working conditions should put sales forces on their mettle to modernize this branch of industrial service long before snow flies.

Industrialists are thinking about replacing some of the highly technical machinery of their own special fields with the latest and most efficient products of the engineering designer. It is a truism to assert that the best results of such investments cannot be had under poor illumination. Moreover, the cost of factory lighting is relatively small even where units of 150 watts are employed. In one plant 200x368 ft. in plan it was estimated that an intensity of 10 foot-candles could be provided by 600 lamps of this rating with a complete wiring and equipment first cost of $4,076. The estimated annual energy consumption was 4,823 kw.-hr. for lighting, making a modest annual outlay for illumination on any ordinary set of rates and charges as compared with the cost of labor. In a smaller plant (165x100 ft.) an engineering study arrived at the conclusion that the annual lighting costs fell well under 1.5 per cent of the payroll. Competition is unlikely to disappear under the present industrial recovery program and improved factory lighting has little chance of being assailed by uplifters as inimical to labor. Utility men know its advantages based on decades of experience, and now is the time to press them home for the good of all concerned.

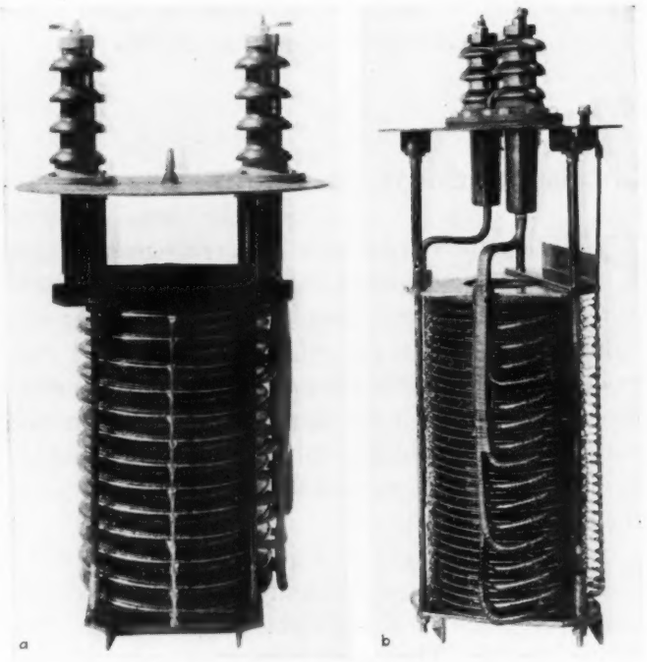
Series Dissipators for Lightning Protection

By W. R. SPITTAL
Manager Ferranti, Inc., New York

FOR the protection of apparatus against surges there are two general alternatives available: (1) Shunt as much as possible of the incoming surge around the transformer, or (2) by means of a series device dissipate the force of the impulse before it reaches the equipment.

The term "surge absorber" for the series device is as much a misnomer as is the expression "lightning arrester" for the shunt device. The series device might more properly be called a "surge leveler" or even a "wave sloper." The expression "lightning arrester" is misleading largely because it conveys the impression that the shunt device stops or arrests the incoming surge. A shunt or discharge device depends for its operation on discharging the surge to earth or grounding the line. This involves three elements: (1) The time required to ground the line, (2) the resistance of this ground after it is applied and discharge current is flowing, and (3) the power follow-up current which may flow to ground with consequent fuse blowing.

In the most modern form of discharge arrester the time lag is of the order of 1 microsecond or more, which in terms of lightning traveling at 186,000 miles per second represents 1,000 circuit feet; that is, the front of the surge has passed the shunt device 1,000 electrical feet before grounding takes place. In the second instance to obtain ideal operation the voltage drop across the shunt device should be zero. This voltage drop varies as IR, and even if R be comparatively small the voltage drop with the large current flowing under discharge conditions may become dangerously high. It is of course recognized that it is not the lightning surge, but the power follow-up current which causes fuse blowing.



Dissipator consists of series coils and interleaved capacitors

(a) A 250-amp., 22-kv. absorber for transformer protection.
(b) A 100-amp., 2,300-volt absorber for generator protection. A larger number of dissipators is used not only to flatten the wave front but also to reduce the amplitude.

Dissipator absorbs momentary surge energy

In a series device, by nature of its connection, the operation is instantaneous. Further, in a series device (Fig. 1) comprised of inductances in series and capacitance in parallel (very much like the filter function of the B-eliminator in a radio set) the ground resistance is relatively unimportant and the efficiency of such a device is practically the same with ground resistances up to 1,000 ohms (Fig. 2). With the series device the line is not grounded, so no power follow-up current can flow and the device cannot cause fuse blowing. The surge absorber ground is simply an electrostatic connection.

The original surge absorber described by E. T. Norris in ELECTRICAL WORLD (January 26, 1929) has since been modified and improved. Unlike the shunt or discharge arrester it operates on the wave front steepness rather than on the amplitude of the incoming surge. Amplitude may be the cause of flashovers from terminal to ground or from transformer winding to case, but it is primarily the rate of voltage rise, or, in other words, the wave front steepness, which causes breakdowns between turns, layers or sections of the winding. Transformer manufacturers know from long experience that in properly designed transformers failures due to lightning are in this latter class, namely, breakdowns between turns, layers or sections.

The surge absorber, since it has no iron core, has practically no impedance drop at ordinary power frequencies, the watts loss being negligible. The inductance of the device under surge conditions varies from 300 to 500 microhenries and capacitance from. 0.001 to 0.05 mfd. The resistance is between 10 and 500 ohms under surge conditions, depending on the type of absorber and the shape of the surge. A study of these values will eliminate any suggestion that the surge absorber bears any relation to the old choke oil, in which the values of inductance and capitance were relatively negligible.

The dissipators in the series device have two functions: (1) They act as a ground plate of the condenser, and (2) the coils build up a magnetic field around the dis-

sipators and under surge conditions the losses due to eddy currents caused in the dissipators by the changing field are very large. It is this feature which makes the series device non-resonating and also helps to reduce the amplitude of the surge. In a 200-amp., 15,000-volt absorber the losses are approximately 500,000 watts under surge conditions for a few microseconds.

Surge absorbers are rated on voltage, current and 60-cycle dry flashover. Since the absorber is in series with the line it is entirely different from a lightning arrester and must be designed to carry full line current. As its tie to ground is simply an electrostatic connection the flashover value of the device must be equal to that of the line on which it is installed. Thus, the above-mentioned ratings must be taken into consideration just as in the case of any other piece of electrical apparatus.

Preferred test waves have been recommended by the lightning and insulator subcommittee of the A.I.E.E. (*Electrical Engineering,* January, 1933) for impulse voltage testing, as shown in Fig. 3. An incoming surge traveling at the rate of about 1,000 ft. per microsecond obviously advances along the transmission line 1,000 circuit feet in 1 microsecond. For simplicity of analysis the amplitude in each case is taken at 1,000 kv. It may be assumed that in the winding of the transformer being protected a wave travels into the winding 100 turns in 1 microsecond. This obtains both for shunt and series protection. The between-turn stresses will be greatest at the end turns, but for ease of consideration (although much less favorable to the series device) we can assume that the front wave stresses are distributed evenly across this 100-turn section. For each wave three conditions are considered: (1) No protection whatever, (2) shunt protection with the latest form of discharge arrester operating in 1 microsecond and having an ideal ground, and (3) series protection operating instantaneously on the wave front steepness.

Rate of voltage rise reduced by dissipator

With a 1x5 microsecond wave, case (a), it is seen that the surge reaches its peak before the modern shunt device comes into action. The between-turn stresses due to the rapid rise of voltage are exactly the same with and without the shunt device (conditions 1 and 2), namely, at least 10,000 volts per turn. But with the series device, functioning instantaneously, the wave front is sloped back, thereby slowing down the rise in voltage in the winding and reducing the between-turn stresses to 1,750 volts per turn for this form of wave, or a reduction of 82½ per cent over that provided by the shunt device.

In case (b) with a 1x10 microsecond wave the surge has reached its maximum value before the shunt device functions, and as before the between-turn stresses are exactly the same as without the shunt device; *i.e.,* at least 10,000 volts per turn. With the series device calculation will show that the between-turn stresses become 2,500 volts per turn, or a reduction of 75 per cent, as compared with zero reduction for the shunt device.

In case (c) with a 1½x40 microsecond wave the typical shunt device comes into play when the wave has reached at least two-thirds of its crest value, but the surge is already 100 turns into the winding, with the result that for the first section the between-turn stresses are at least 6,700 volts per turn either with or without shunt protection. Here again the surge absorber reduces the between-turn stresses to 2,500 volts or less per turn, or a reduction of 62½ per cent.

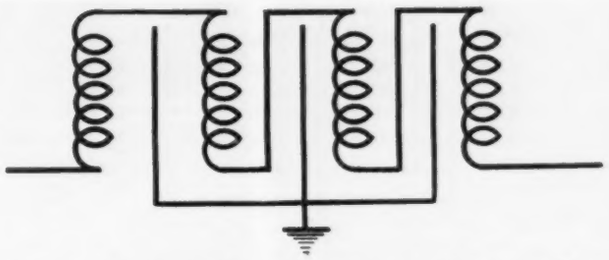


Fig. 1—Dissipator follows principle of low-pass filter

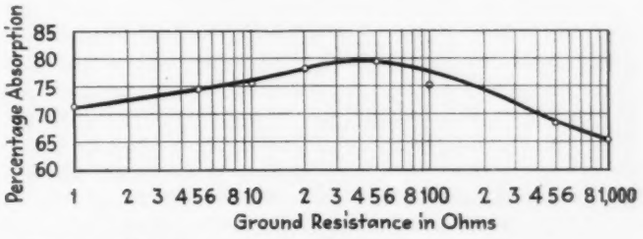


Fig. 2—Effectiveness not affected by ground resistance

Up to 1,000 ohms of ground resistance the percentage absorption of a 75-kv. surge on a 12-kv., 20-amp. surge absorber is only slightly affected by ground resistance.

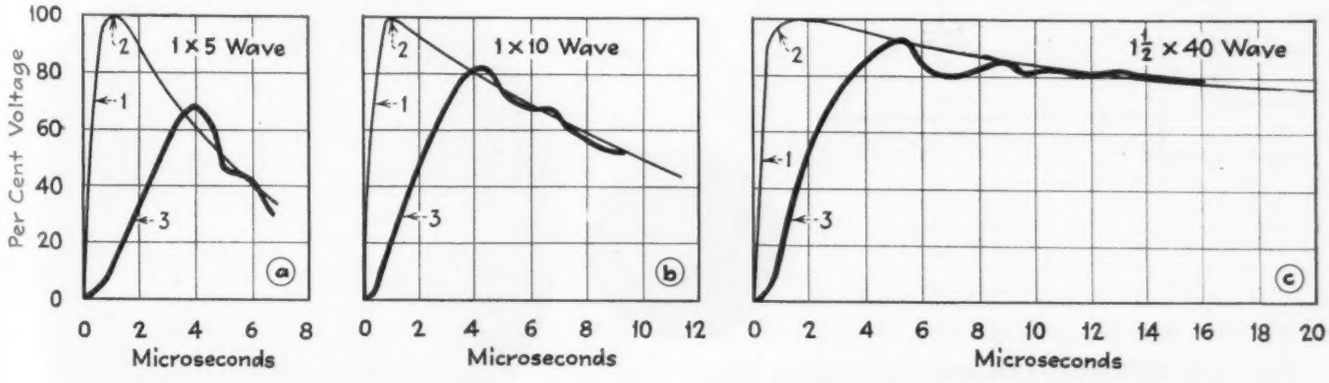


Fig. 3—Standard waves well attenuated by dissipator

(1) The waves defined for surge testing.
(2) The earliest point of operation with modern shunt protection.
(3) The resultant wave with series protection.

	Between-Turn Stresses, Volts per Turn		
	(a)	(b)	(c)
Without protection (1).....	10,000	10,000	6,700
Shunt protection (2).....	10,000	10,000	6,700
Series protection (3).....	1,750	2,500	2,500
Percentage reduction by series protection, per cent.....	82½	75	62½

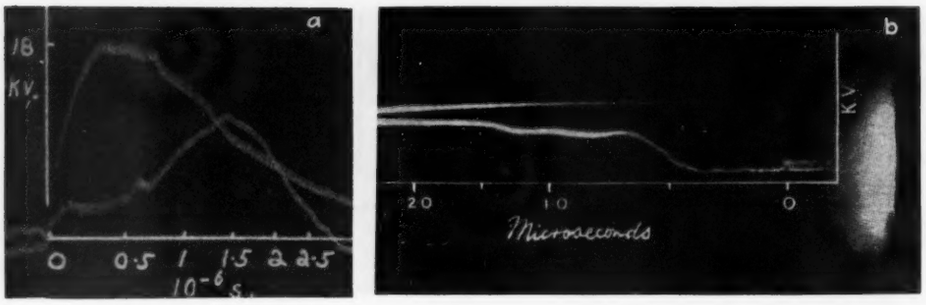


Fig. 4—European tests show wave sloping effect

(a) English oscillogram by Dr. Miller shows effect of a surge absorber on a $\frac{1}{3}$x1$\frac{1}{2}$ microsecond wave.
(b) German oscillogram by Professor Binder shows flattening of a $\frac{1}{10}$x100 microsecond wave.

At this point it should be particularly noted that of the three waves proposed by the standards committee it is only in this last type where the between-turn stresses are lowest and where protection is least required that the shunt device function before the wave reaches its maximum, and even here no protection is provided for one whole microsecond.

Steep wave amplitude also reduced

Oscillograms of surges with and without series protection were taken by Dr. Miller of England and Professor Binder of the Technische Hochschule in Germany (Fig. 4). Dr. Miller's oscillogram, covering a $\frac{1}{3}$x1$\frac{1}{2}$ microsecond wave, indicates that for this shape of wave not only is the front sloped off, but the amplitude is reduced to almost 60 per cent. In Professor Binder's oscillogram of a $\frac{1}{10}$x100 microsecond surge (a much more severe impulse than would ever be met in practice) the sloping off of the wave front is again in evidence, and it is seen that the effectiveness of the series device varies directly with the steepness of the wave front, thus the more dangerous the wave the greater the protection offered.

Indication of the reduction in stresses within the transformer is shown by the klydonograph (Fig. 5). The tests were taken under exactly similar conditions, except for the addition of the absorber, and both records are to identically the same scale. The percentage absorption of a surge absorber is actually the percentage reduction in voltage between the end turns of the transformer.

Supplementing the laboratory tests, a series of tests was recently carried out with the assistance of G. B. Melton and associated engineers of the Yorkshire Electric Power Company on an 11,000-volt standard three-phase distribution transformer. The tests reveal the following information: Surges to the number of 524 were sent into the winding and then the transformer was completely dismantled. No failures were found to have occurred between the winding and ground or between primary and secondary windings. Numerous breakdowns occurred between turns, layers and sections, which information indicated definitely that the failures were a function of the wave front steepness and not of the amplitude of the incoming surge. A surge absorber was connected in series with the second leg of this transformer and the same tests repeated. After this the winding was dismantled and the coils completely unwound and no sign of damage was found after careful examination turn by turn. From these tests it may be concluded that the windings of an ordinary transformer will not withstand surges such as they may receive under normal operating conditions unless protected by some effective series device.

This is in agreement with operating experience that in nine cases out of ten failures due to lightning in properly designed transformers are between turns, layers or sections; *i.e.*, they are not caused by the amplitude of the wave, but by the steepness or rate of change of the incoming surge.

Dissipator capacitance increased for machine protection

For the protection of motor or generator windings where the stress to ground is of major importance a larger number of dissipator plates is employed, thus

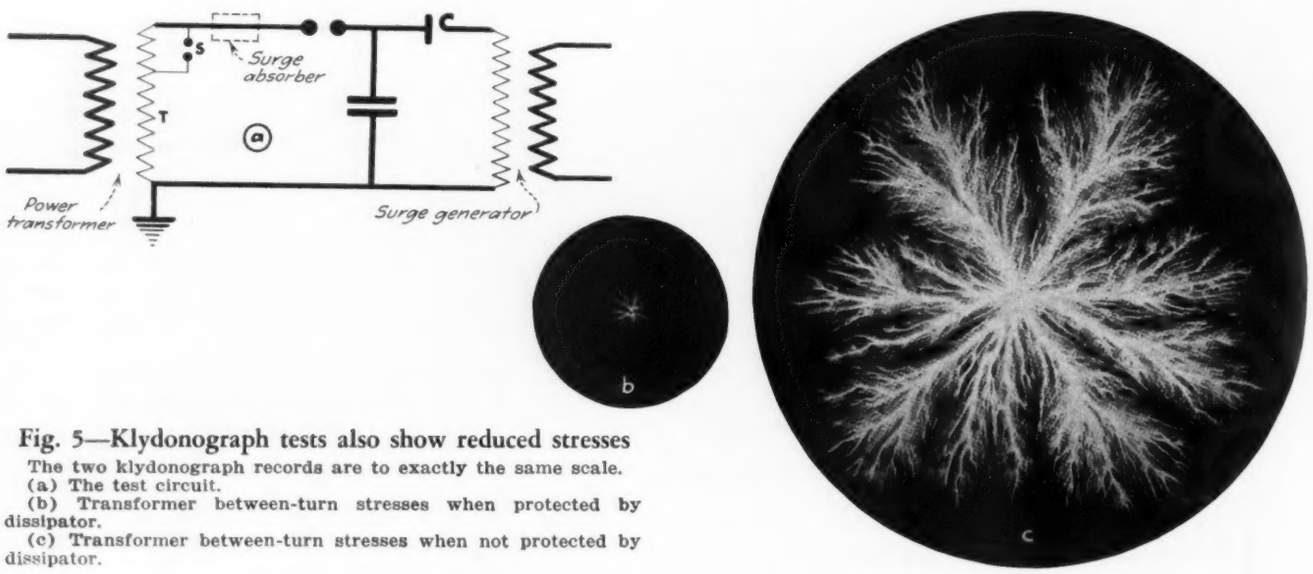


Fig. 5—Klydonograph tests also show reduced stresses

The two klydonograph records are to exactly the same scale.
(a) The test circuit.
(b) Transformer between-turn stresses when protected by dissipator.
(c) Transformer between-turn stresses when not protected by dissipator.

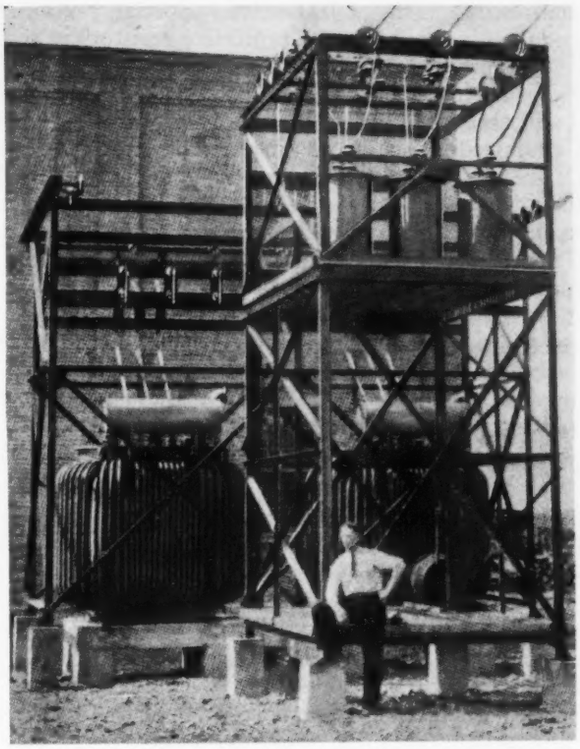


Fig. 6—A bank of three 125-amp., 12-kv. absorbers
Operating in the mining district of northern Quebec under particularly severe lightning conditions.

increasing the capacitance of the device and effecting not only a flat wave front, but also reduced amplitude. This modification is particularly important where the factors of safety involved are considerably lower than those obtaining in transformers.

In conclusion, it is interesting to note that although the acceptance of series protection in the United States has been of a rather cautious nature, surge absorbers have been accepted and are installed in practically every other country in the world. Operating experience of a few users follows:

"The arrester was removed at the time Ferranti surge absorbers were installed. We have had no transformer failure at this installation since the surge absorbers were installed, and I would judge that the frequency and severity of the lightning storms in this district were comparable to what they were during the two seasons preceding the installation of the surge absorbers when transformer failures actually did occur." (Canada.)

"Since the installation of absorbers we have had a few flashovers on the lines due to severe lightning storms. These disturbances were not transmitted to machinery in the station." (Greece.)

"In the three years prior to the installation of surge absorbers five breakdowns of 6,000-volt winding motors were directly attributable to lightning. Since the surge absorbers have been put into commission no breakdowns have been experienced." (British Isles.)

"When our overhead line was struck reflective surges passed along the submarine cable and invariably put out all rotary equipment on the island. A set of 11,000-volt surge absorbers was put in at each end of this line and the previuos arresters removed. These have now been in operation over twelve months and although there have been many very bad storms on no occasion has a single rotary come out." (Malay States.)

A recent survey completed by the Ferranti organization indicates that 80 per cent of central stations with operating experience with these series dissipators have installed additional units. The same worldwide survey reveals that in a period of more than five years there is not a single instance where the surge absorber has failed to give the protection expected of it.

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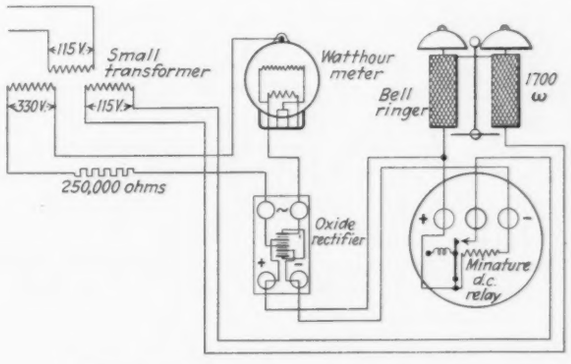
Meter Insulation Test With Safety and Speed

By L. K. YERGER and E. A. LeFEVER
Buffalo General Electric Company

Good insulation is a prime requisite for meters, especially where the new meter sequence is used with the meter ahead of the customer's main fuses. Limitations and even hazards of prevailing methods of testing meter insulation have led to the adoption in the western division of the Niagara-Hudson Power Corporation of a new scheme, which is safe, inexpensive and equally applicable to large or small testing laboratories. It limits the testing voltage exposure to 330 volts and the test current to 1.3 milliamperes, less than one-fourth the value which the human body can stand before a shock sensation is more than perceptible.

The device consists of a 115/330-volt transformer, a limiting resistor, rectifier, d.c. relay and a bell ringer. The rectifier is used because suitable and moderate-priced sensitive a.c. relays are not available. The d.c. relay will respond readily to currents of the order of 100 microamperes. A predetermined relay setting limits the insulation impedance at which time the device operates. In the case of a watt-hour meter this should be at least one megohm. It was found that new watt-hour meters received from the manufacturer have an insulation impedance from 4 to 10 megohms. The device used is sensitive and will detect poor insulation which could not be detected without the use of high-voltage megohm equipment or certain sensitive forms of neon arrangements.

The device can be adapted to boards designed for testing one meter at a time or those arranged for group testing. A separate device for each five meters is recommended on group test boards as the capacitance current



Meter insulation tested at low voltage
Transformer constructed of watt-hour meter potential coils applies 330 volts to meter insulation through carbon limiting resistance. A General Radio instrument rectifier closes the small Weston d.c. relay and rings the polarized bell if the insulation is defective or below a predetermined value.

becomes excessive for larger numbers. Slate panels having metal veins may require special insulation of meter hooks; 330 volts was selected largely for this reason. However, this can be easily overcome by bushing with bakelite or similar material. The device as used is arranged so that when meters are placed on the quick set-up connection block they immediately receive insulation test, and should a defective meter be hung up the bell will ring automatically. This is a time saver also in that as soon as the meter is set up the tester is advised at once that it is defective. It eliminates extra operations by the tester and assures that each meter is tested for insulation in an automatic manner.

This method can be adapted to other insulation test equipment when higher voltages are desirable. A device similar to the above was built for use on street lamp insulation testing, using 1,100 volts. Special precautions were taken in mounting the protective resistors in sealed bakelite tubes to prevent any leakage around them. The device also may be used safely without rubber gloves and still obtain the benefit of high voltage.

Carbonized insulation on current coils caused by overload, defective terminal chambers and other similar defects are not easily detected without disassembling meters. A 115-volt magneto test or a simple neon lamp will not necessarily indicate this condition. High-voltage tests, with attendant hazards, have been eliminated. The smaller the test department, the less will be the volume of work, and naturally the simpler the test equipment must be both from the standpoint of safety and cost of equipment. This company feels that these requirements have been well met by this type of equipment.

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Electrical Index Closely Records Mill Activity

That electrical energy consumption is a reliable gage of fluctuations in manufacturing activity has been shown in several articles published during recent years in the ELECTRICAL WORLD.*

Index numbers based on reports of kilowatt-hours used agree—often with remarkable fidelity—with those based on entirely different series of data. Such dissimilarities as may occur can in general be readily accounted for. The primary problem in carrying on studies of this subject is to find statistics that are fairly comparable.

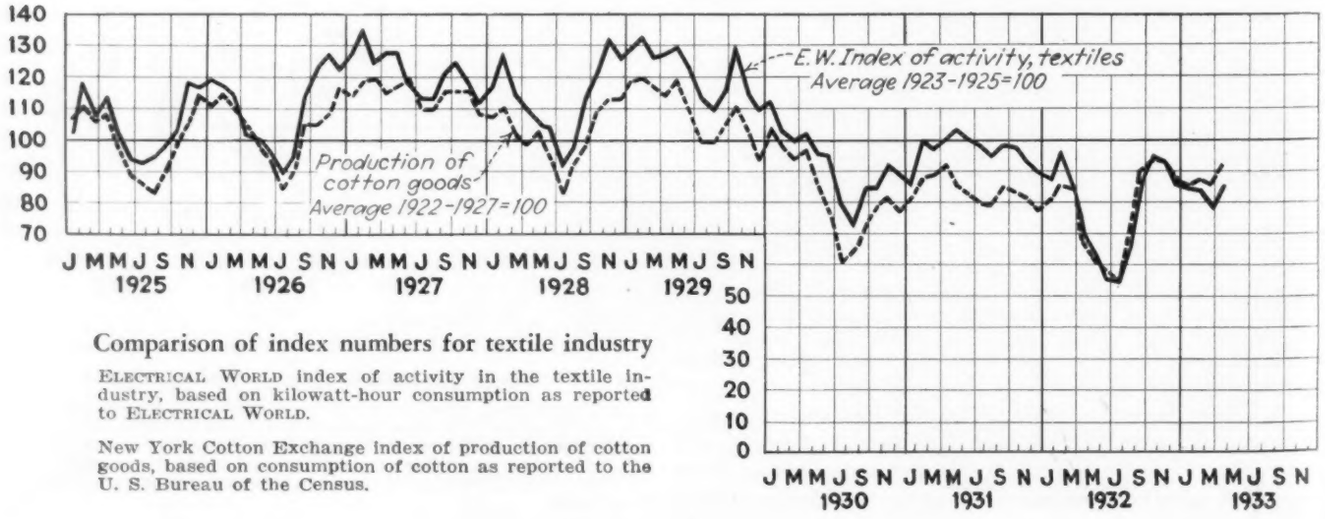
The accompanying chart affords a comparison for the textile industry. Along with the index numbers published each month by the ELECTRICAL WORLD there have been plotted the Index Numbers of Production of Cotton Goods, made available through the courtesy of the New York Cotton Exchange Service. This latter series is based on the consumption of cotton as reported monthly by the United States Bureau of the Census.

Certain minor sources of disagreement will be evident. The ELECTRICAL WORLD figures are based on the average monthly energy use during 1923-25, while those for the Production of Cotton Goods are based on the average for 1922-27. The ELECTRICAL WORLD index, moreover, includes textiles other than cotton. Since the manufacture of cotton goods is by far the dominant branch of the textile industry, both in relation to nation-wide production and in the reported energy consumption, it follows that this difference will unequally affect the two curves only when the usual balance between the various branches of the textile industry is seriously disturbed. That might happen, for instance, if a lull in cotton coincided with greater activity in woolens and rayon goods.

Again, a change in the ratio between fine and heavy goods might make a difference, one class using more kilowatt-hours than the other per pound of cotton worked up.

In the light of these possible reasons for moderate discrepancies the similarity of the two curves is quite striking. Reference to the original consumption statistics discloses that the average for 1922-27 was 3.5 per cent greater than for 1923-25. If the two curves were referred to the same base, therefore, the ELECTRICAL WORLD curve would be lowered or the "Production" curve raised proportionately, thus bringing the two even closer together for almost the entire period.

Automobiles, February 14, 1931, page 341; rubber, August 29, 1931, page 390.



Comparison of index numbers for textile industry

ELECTRICAL WORLD index of activity in the textile industry, based on kilowatt-hour consumption as reported to ELECTRICAL WORLD.

New York Cotton Exchange index of production of cotton goods, based on consumption of cotton as reported to the U. S. Bureau of the Census.

Basic Soundness of Utility Investments Remains Intact

OUTSTANDING interpretations of present trends in public utility security investment grading pointing to a hopeful outlook for the future featured two papers before the National Association of Mutual Savings Banks at Swampscott, Mass., recently by F. V. Henshaw of Wood, Struthers & Company, New York, and C. F. Blanchard of the Standard Statistics Company, New York. Both authors emphasized the remarkable stability of the gas, electric and telephone industries in the depression and offered encouragement to discriminating investors in the utility field, notwithstanding the handicaps of increasing taxation, misuse of some holding companies and popular pressure for lower rates. Each regarded the entry of the federal government into the power field in threatened competition with private power companies as a serious evil, but expressed the opinion that the injury to the industry from this course is likely to be exaggerated.

Extracts from Mr. Henshaw's paper

It is something of a tragedy for gas, electric and telephone utilities that the words "public utility" have been so greatly abused. For many years the New York Stock Exchange has given a classification to railroads and put everything else under the term "industrials." The investment manuals went further by separating industrials and public utilities, but unfortunately included in the latter group every corporation that had or seemed to have the remotest connection with them. The tragic consequence of such loose classification is that when a very large Chicago company of the investment type gambled away its assets, to the cruel loss of many people, the disaster was seized upon by many as an evidence of evil practice in the conduct of the utility business. One might as well hold that the Kreuger scandal was an indictment of match manufacturing.

Investment status of utility mortgage bonds is good

From a recent chart of utility bond prices it appears that an investor who bought an equal number of such bonds selected at the highest average price and sold them at the lowest average price during this period of 2¼ years would have suffered a loss of about 12 per cent of his capital; at today's price he would lose about 8 per cent. In a similar transaction in the selected industries he would lose about 35 and 28 per cent, respectively. Had the selection of securities which composed this chart included only the better grade utility bonds, the losses would have been considerably lower.

Utility bonds have been legal investments for New York state savings banks only since March, 1928. The original list of legal bonds was largely tentative, since the Banking Department had not had time to procure the necessary information. Counting all bonds that were from the beginning either approved or tentatively suggested, there were 225 issues of 87 companies. On

Threatening legislation probably impermanent.

Taxation burdens handicap progress.

Wasteful governmental competition ahead.

A warning to holding companies.

December 31, 1932, there were 202 issues of 73 companies. Of the 23 issues that disappeared, twelve were stricken off through failure of the companies to furnish the necessary information, three issues matured or were called, six issues of two companies were removed because the companies increased their debt above the legal limit and only two issues of one company lost their legal position through failure of the company to earn the required margin over bond interest. The results of the extreme depression of 1932 are expected to remove the bonds of only one important company, although there are others close to the edge. It should be noted that even the one obvious "goat among the sheep" that was cast out in 1932 is still some distance from default, while the important company that will go off the legal list this year is earning its charges by an amount that would comfortably insure the legal status of railroad bonds.

Reasons for utility stability

Superficially it may seem as though there must be something questionable about a business that, during a year of intense industrial and agricultural depression, can earn from two to four times fixed charges, as has been the case with company after company in the electric, gas and telephone industries. But the services rendered by these utilities are necessary, desirable, useful, and often an economy in both the conduct of general business and in the social life of the nation.

Existing uses and the development of new uses for utility services result in an enormous diversity that spells stabilization. Again, utilities have been financed largely from the proceeds of equities and less from the proceeds of mortgage bonds. The better managements have, indeed, striven to maintain conservative capital structures. A compilation of the capitalization of all the utilities comprising the New York legal bond list in 1931 gives an average ratio of stock to total debt of 127.8 per cent for electric and gas companies and 234 per cent for operating telephone properties. Comparing this with railroad capitalization, only the Norfolk & Western exceeds the electric and gas companies with a ratio of 172 per cent. The Atchison's stock ratio is 118 per cent, and a number of other rails have more bonds than stock.

While the utilities cannot go the way of the rails, they can be pictured as fated to be squeezed to death between rate reductions at the bottom and taxation at the top. But, after all, are not the American people in very much the same position? At present it is somewhat unfortu-

nate for the utilities that progress in the economics of the business was so rapid in the past decade, since it resulted in an almost continuous reduction in rates and improvement of service, very largely voluntary on the part of the companies since pre-war times, during which the cost of everything else increased. When, therefore, the cost of living took a sudden drop, it caught the utilities at a point that had long ago overdiscounted the later decline in living costs, and there is therefore no room to beat them down much further without unjust discrimination.

According to a government report, in December, 1932, the cost of electricity was 21 per cent below 1913 and the cost of living 32 per cent above that date.

Taxation and closed banks impose heavy burdens

Utility taxation of all kinds has been greatly increased, and there is a tendency to impose a most destructive kind of taxation by levying on gross revenues. During the depression the utilities have been placed in an awkward position, since as a matter of policy they cannot fight for their rights or recover the amount of increased taxation through raising their rates at a time of general distress. In this depression an entirely new and unexpected development has arisen to plague the utilities and results from the large number of closed banks. Until recently the utility business has been on a cash monthly settlement basis and, except during new construction periods, required but little working capital. To some extent bank closings have converted the utility business into a credit operation, with the accumulation of some dubious paper. A good deal of service must either be given on credit or the good will of old customers sacrificed. It seems probable that when conditions have reasonably improved there will be a let-up in the demand for lower rates and increased taxes and that the companies will find themselves possibly in a stronger position than ever to ask for fair treatment.

Adverse legislation likely to be temporary

It is hard to believe that recent developments in legislation which seem to violate established legal safeguards are permanent changes rather than emergency measures; therefore the author holds that constitutional rights and established legal precedents will continue in force. If so, the operating utilities are protected against confiscatory rates and will, in the end, be permitted to include the taxes imposed upon them in the rates charged to the public. While the depression continues there will be demands for lower rates, and to an extent, many companies will continue to waive their rights as far as they safely can and accept temporary reductions below those to which they are legally entitled.

In the end the utilities are likely to have a better standing with the public than they have in the past. As to possible effects of stricter regulation, it is the author's belief that regulatory commissions have been and are desirous of preserving the credit of the utilities. While the commissions sometimes have little consideration for the common-stock holder, he "does not think any of them would willingly seek to impose burdens that might imperil the preferred dividends of any honestly managed and reasonably capitalized company. In my experience," he states, "I have found them anxious to preserve the integrity of mortgage bonds. In short, I do not think that the owner of any sound operating utility bond need fear for his investment as a result of rate cutting or taxation. Under anything that could be called fair rate regulation and taxation, such operating utilities have demonstrated their ability to earn enough to maintain the integrity of their debts under any conditions much short of industrial prostration and penury in the territories served."

For the holders of equities, the situation seems to resolve itself into a race between the advance of returning business prosperity and the progress of rate reductions and increased taxation. It seems reasonably certain that a marked improvement in business, employment and commodity prices would largely halt agitation for reduced rates, and certainly would put the companies in a better position to resist unjust taxation.

Muscle Shoals prospects imply wasteful competition

It is an uncomfortable thing for utility security holders to anticipate that the United States government is going into competition with companies (as in the Muscle Shoals project) in which they are financially interested. It would seem that a number of investors have probably been selling bonds of utilities in Tennessee, Alabama and Georgia, and, if so, their loss might be charged to lack of frankness by the federal government in giving the public nothing more than vague statements as to what it is expected to accomplish by further developments of the Tennessee River power resources. Muscle Shoals is not and never can be a large power source nor a producer of cheap power, and it is contiguous to a territory in which power is produced cheaply from other sources. Interest alone at 3 per cent is equivalent to about 4 mills per kilowatt-hour, or about double the cost of power from a modern steam plant in Alabama, and leaving nothing for operating expenses, depreciation and emergency costs.

It seems obvious that the probable plan in mind, and in fact the only way in which this water power could be sold to the public would be if possible to induce a few municipalities like Chattanooga, Memphis, Birmingham, etc., to acquire by some means municipal plants in consideration of the government's supplying power at some nominal figure, in which interest on the investment would be eliminated. It is difficult to see how the municipalities would gain anything, and it is harder to imagine the taxpayers taking on such a burden. Undoubtedly government power offered at starvation prices could injure the utilities, but it is at best a vague threat and will not have to be made for some years. It is possible that the construction of Cove Creek may, as reported, require the acquisition of some 60,000 acres, and that condemnation proceedings could easily take two years if done in the usual way. All in all, it would be surprising if the government will be ready to enter the power business in the Tennessee Valley for at least five years. Perhaps by that time either all industry will be nationalized or the government may have decided to govern rather than to institute business competition with its own citizens.

Mr. Blanchard on holding companies

Some twenty holding companies of larger size with a host of smaller ones dominate the electric, telephone and to a lesser degree the gas and water business of the country. They have been and still are of considerable public interest, because, for one reason, their stocks have undergone such a tremendous rise and fall in value during the past decade and because they are under fire from

many quarters. The interest of a majority of the mutual savings banks in these companies is perhaps indirect, as their security issues are outlawed for savings banks by many states, but their hand is important in directing the policies of many operating companies.

In the past few years utility holding companies have been hard put to justify their existence. They have been very important contributors to the progress of the industry by way of engineering skill and especially by financing. Large sums were required which many companies, weighted down by the burdens of decadent utility services like tractions, could not supply without assistance. Interconnection was facilitated, and, in general, the holding companies fully justified themselves as factors in industry development. Carelessness and the prostitution of the higher purposes for which holding companies were originally established entered the scene, however; earnings ebbed and the foundations revealed by the receding tide showed many weak structures, although others are seen to rest upon sound financial and managerial bases.

Investors in such organizations have suffered untold losses. The stockholder's position is obviously always one of risk, but in these disasters even bondholders have lost everything. This has not been confined to utility security holders, but the prestige of holding companies has suffered a severe blow.

The present contribution of the holding company to the general advancement of the industry is now distinctly less than it was a few years ago. Legitimate management assistance and intelligent handling of rates are the greatest need of the industry. Engineering functions have been greatly circumscribed by the surplus of plant facilities. It would appear that a number could easily slip back into the status of investment companies, certainly a legitimate position, but it is doubtful if this can be done now.

Attitude of the public is critical

Partly as a result of misguided policies which have come to light and partly as a result of the times and of unworthy stewardship in some quarters, the holding companies are now on the defensive. Consumers are becoming rapidly resentful at having to pay rates which they regard as supporting a heavy superimposed capital structure. Investors are also suspicious and resentful. The government, under the leadership of certain overzealous demagogues and others, is against the holding companies and some sections of the press seize upon every opportunity to give them unfavorable front-page publicity. Moreover, it is apparent that those who hold control of these properties are not going to give them up without a struggle, and so far as the author can see, the recent past, with its important lessons, is regarded as a mere unpleasant interlude to the pursuit of former tactics. The author has hoped to see the industry established upon a sound basis so that it could begin the next era of prosperity in a clean-cut fashion, but he fears that this is not going to be accomplished and that we may be in for another and, he hopes, final interval of possibly less rampant difficulties like those of the past.

Had it not been for the efforts of the more legitimate concerns of this character, of which there are still a goodly number, the industry's progress would have been far less. By contrast, Europe reveals that the United States is unsurpassed in the reliability and dependence of its utility service. Moreover, to investors in operating company securities the holding companies are a strong bulwark, as their selfish interests alone compel them to make every effort to preserve the financial integrity of their operating subsidiaries. But the brand of disapprobation for the sins of the outlaws has been deeply burned into practically every member of the tribe, and they face important opposition. Theirs will probably be a fight for existence under circumstances which point to their ultimate complete subordination after the end of the next cyclic rise in business.

Higher net revenue if business gains

Despite the fact that the utility industry is exposed to governmental competition and disapprobation, the possibility of sterner regulation, an insistent demand for lower rates, higher taxes, higher operating costs as a result of inflation and the burdens of excess plant capacity, the pleasing prospect is that business upturn will markedly improve net earnings. A higher volume of business can be handled with very little increase in operating costs. Revenues of the average company are down about 15 per cent from the 1930 highs; many are much better off, and the record is certainly better than that of most industries. Their efficiency has increased measurably under adversity.

If business continues to gain, it is probable that many of the above problems will disappear. The tax on electrical energy sales now about to be foisted upon the companies for no very good reason, save that it is the will of Congress, can be offset very quickly by a few months' steady rise in revenue. If business improves, with resulting increased income for individuals, the matter of rates will probably not be of such pressing interest.

For the moment we are not faced by the prospect of any enlargement of the powers of the Federal Power Commission, and this body is hardly to be viewed as a potential danger to the welfare of investors in sound utility enterprises, provided the laws it is called upon to administer are not downright vindictive. If endowed with control over the holding companies it can be a good influence during the next boom. The Power Commission is unlikely to become the counterpart and repressive influence of the Interstate Commerce Commission, since it will not be expected to enforce competition; moreover, public utility rates are largely local matters, the right to regulate which will be jealously guarded by the various state bodies.

Muscle Shoals a losing venture

So far as public utilities are concerned, such projects as Muscle Shoals are not to be overemphasized in their powers for damage. It will require a tremendous amount of money; the market for power within easy striking distance is quite limited, and all important centers are adequately served by private companies with proper franchises. It cannot possibly become a factor for several years, and the government's reputation for the successful conduct of almost any business enterprise is such that we can probably expect it to be a losing venture from the start. Municipal ownership also takes money which few cities and towns now can raise.

Utility taxes are a grave menace, however. It is not an unusual spectacle in the United States for prosperous enterprises to be taxed into destitution, and as investors in public utility enterprises, you have a right to know that this danger impends.

Supporting Risers and Horizontal Runs

By VIVIEN KELLEMS

FOR 30 years woven-wire cable grips have been used almost exclusively for handling lead-covered cable and pulling it through conduit. The gripping and holding power obtained in this service, coupled with the ease of applying, removing or adjusting the position of the grip, has lately induced a number of companies to develop other applications. The new uses come under the general category of supporting, anchoring and dead-ending vertical and horizontal cables or conductors whether covered with lead, braid or steel armor. Involved in the newer installations are submarine cable, risers in buildings, mine and tunnel shafts, power houses and substations, vertical cable below potheads, cables embedded in loose earth subject to landslides, cables on long steep declivities, tree and weatherproof wire and house services.

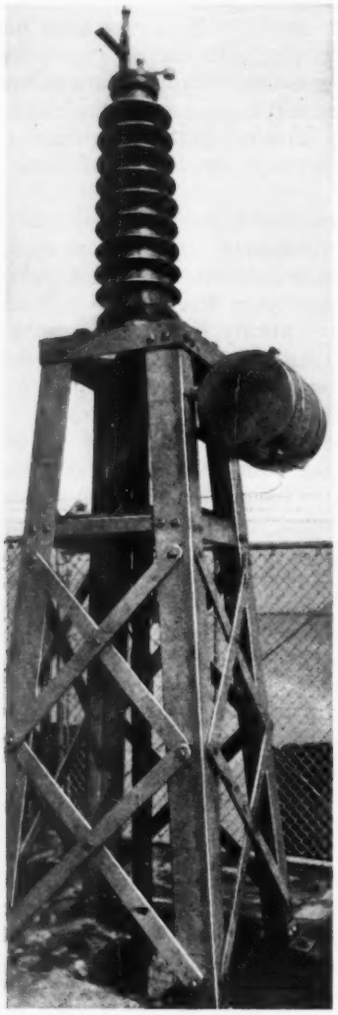


Fig. 1—Possibility of submarine cable separating from potheads prevented by cable grips

While holding power and ease of application and removal had been demonstrated by prior usage, some other requirements were involved in the newer applications: (1) Uniformity of grip throughout its length to assure maximum holding power and to distribute stress so the covering of the cable or conductor would not be injured; (2) ability to grip oval, round or other cross-sections with coverings, ranging from dry insulation to steel armor; (3) resistance to corrosion, and (4) sufficient flexibility in grip to prevent concentration of bending in the conductor when subjected to vibration or swaying in the wind. That these requirements have been met is indicated by the applications illustrated and discussed.

One type of application for which the woven-wire grip is *not* adapted is where the conductor covering softens and migrates easily with seasonal or daily temperature changes.

The first requirement has been met by using wire-mesh grips in which the pitch of the mesh gradually decreases from the holding eye to the other end of the grip. Tests have indicated that with this con-

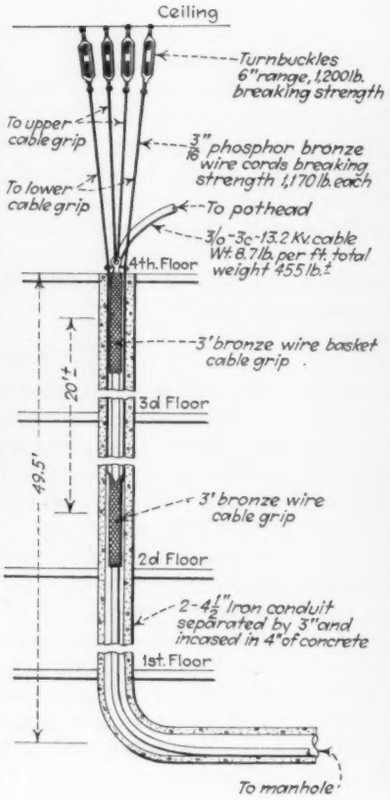

Ceiling
Turnbuckles 6" range, 1,200 lb. breaking strength
To upper cable grip
3/16" phosphor bronze wire cords breaking strength 1,170 lb. each
To lower cable grip
To pothead
3/0-3c-13.2 Kv. cable Wt. 8.7 lb. per ft. total weight 455 lb.±
4th. Floor
3' bronze wire basket cable grip
20'±
3d Floor
49.5'
3' bronze wire cable grip
2d Floor
2-4½" Iron conduit separated by 3" and incased in 4" of concrete
1st. Floor
To manhole

Fig. 2 — Two risers consisting of 50 ft. of No. 3/0 three-conductor, 13.2-kv. cable weighing 8.7 lb. per foot supported by cable grips at top and 20 ft. below in Traders Building, Kansas City

struction the gripping power is uniformly distributed so no part of the cable or conductor is subjected to a cutting action and a holding power is developed equivalent to the strength of the wire mesh.

The Safe Harbor Water & Power Corporation reports that two I-beams were hung from such a cable grip attached to a 500,000-circ.mil cable for some time to determine the permanency of its holding power. But the Grand Canyon application (Fig. 3) is a more severe test. The Northern States Power Company, which has used such grips "where an extra good looking service job is required, and where there are trees and shrubbery to contend with," reported, when questioned regarding the effect on the service wire insulation, that no cutting action had been reported and that it would take time to ascertain if any occurred.

Ability to grip different shape cross-sections covered with different materials is indicated by the accompanying illustrations. Where corrosion is a factor phosphor-bronze wire mesh is used. Avoidance of crystallization of the conductor or cable, when subject to prolonged swaying and vibration, is well indicated by the use on house services, the grip being flexible enough to bend with the wire and prevent concentration of the bending action.

The first instance known to the writer of the use of flexible cable grips for the newer applications was on the eight 75-kv. submarine cables of the Philadelphia Electric Company crossing the Delaware River in the vicinity of Wilmington. Here the vertical ends of the cable just below the terminal pothead (Fig. 1) were supported by flexible grips to relieve the strain on the pothead joint and prevent separation. The cables are anchored at either side of the river by turnbuckles and chains attached to the steel armor 1 ft. below the water.

Originally it was intended to support the dead weight of the cable between these anchors and the potheads with double-eye woven-wire

Fig. 3—Portion of 12,000-ft. run of three-conductor, steel-armored, 250,000-circ.mil cable weighing 10 lb. per foot supported at intervals in Grand Canyon by cable grips. The lower two-thirds of the stretch shown is 500 ft. long and is supported by one cable grip

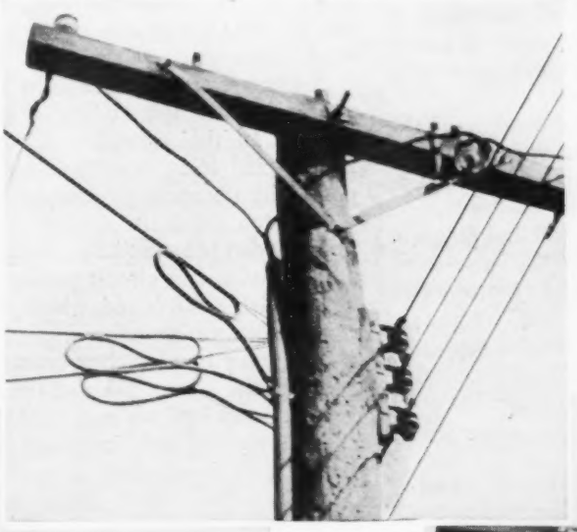


Fig. 5—Loops in these services permit moving pole several feet without cutting conductors by shifting cable grips

Fig. 4—Five house services attached to this transformer pole by cable grips. Crystallization of conductors due to swaying in wind minimized by flexible attachment. Slack can be easily adjusted

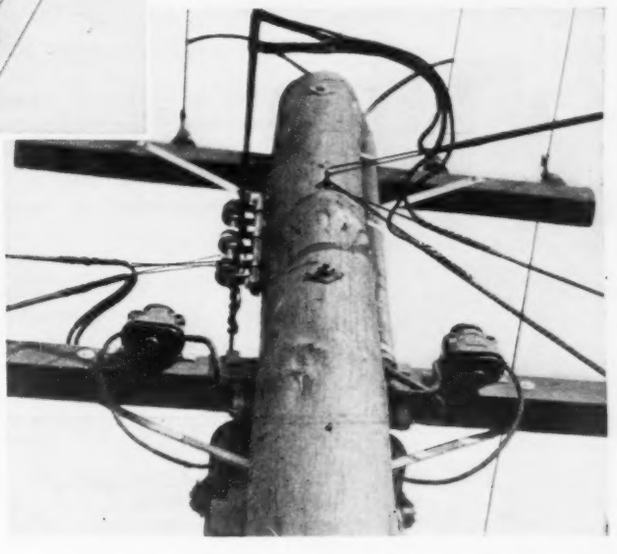
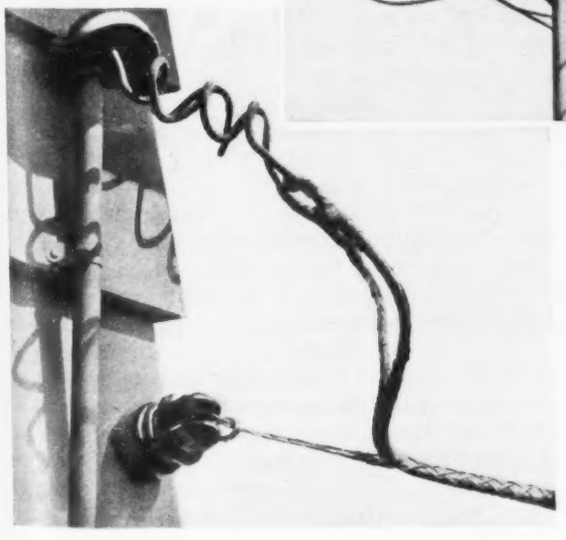


Fig. 6—Single insulator and cable grip dead-end house service



Comparative Cost of Two Types of House-Service Attachment (Rockville Center, L. I.)

Overhead charges and time and cost of transportation to and from job omitted for simplicity.

Variable Mesh Grips		Branches with Marlin Ties	
1 bracket No. 283	$0.13	1 service bracket	$0.64
2 service grips	0.63	1 bracket No. 283	0.13
1 screw drive hook	0.07	4½ x 3-in. lag screws	0.07
Labor	0.58	Marlin	0.05
		Labor	1.72
Total	$1.41	Total	$2.61

grips approximately 4 ft. long, suspended inside the pothead support. But it was decided to loop the 190 ft. which remained on each side after laying and support it in horizontal troughs 9 ft. below the potheads. Hence there was no real problem of support in this case, but cable grips were used, nevertheless, to prevent stresses in the pothead junction in case the cable should slip out of the trough and to avoid dropping the cables into the river in case they burned out at the potheads.

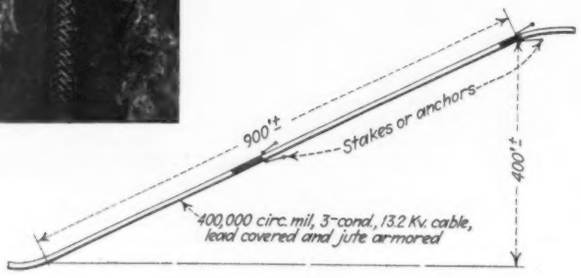
In the Traders Building, Kansas City, Mo., is another application of cable grips where two 50-ft. risers of three-conductor No. 3/0 13.2-kv. cable weighing 455 lb. each were thus supported by the Kansas City Power & Light Company. The accompanying illustrations (Fig. 2) show the construction employed.

While it is recognized that the problem is not quite comparable, it has been the practice of the American Telephone & Telegraph Company, for years, to lash lead-covered cable risers (up to 2⅝ in. diameter) to a steel messenger, at intervals of 10 ft., using galvanized-iron wire wrapped tightly around the cable and laced through the strands of the messenger. Failure of this type of support has never been reported, but the weight of power cable and the type of insulation used present a problem not encountered in telephone work.

However, it is believed that some modification of the Kansas City support or a steel messenger attached to the cable with flexible grips at 50-ft. intervals would be suitable for 700-800-ft. power risers.

The many failures of riser cables in tall buildings in New York City indicate that not only the insulation but the methods of cable support should be reconsidered. Up to the present 700-800-ft. cables have frequently been hung in conduit and supported from the top only. Supports at intervals along the cable would go far toward mitigating past troubles. Unless the mechanical protection afforded by armor wire is the chief reason for its use, the space occupied by it in the conduit might better be saved by omitting the armor wire and using a messenger and flexible cable grips placed at accessible points. Tests demonstrate that a spiral wrapping of wires with uniform pitch (such as used in armor) does not transmit its support to the cable uniformly like a variable-mesh cable grip.

Fig. 7—900 ft. of 400,000-circ-mil, three-conductor, 13.2-kv. lead-covered cable on 45 per cent grade protected from landslides by cable grips at top and mid-slope attached to anchors



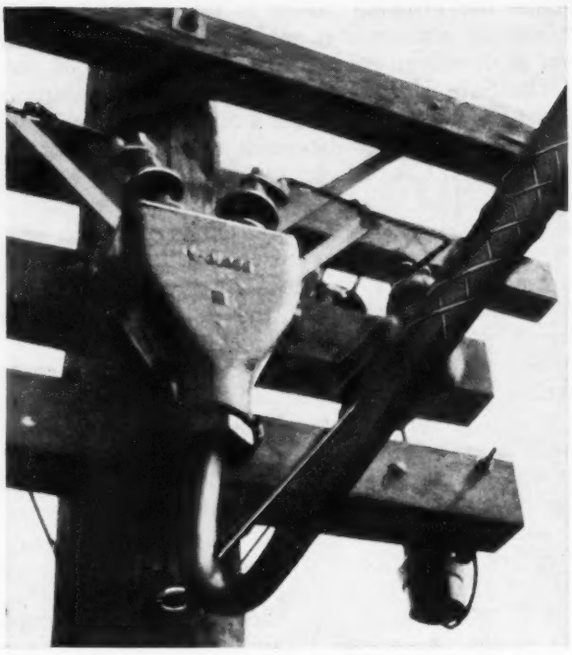


Fig. 8—Aerial cable supported by cable grips at each pole. Cable grip is attached to ring in pole just below pothead

A mine-shaft installation in Minnesota affords another example of the use of flexible cable grips for supporting risers. In this case 150 ft. of three-conductor No. 4 rubber-clad telephone cable with braid covering is supported by phosphor-bronze grips.

Between the Safe Harbor Water & Power Corporation's hydro plant and the operators' village on top of the adjacent cliff is a circuit consisting of three No. 2 5,000-volt cables, 240 ft. of which is run vertically inside a conduit up an elevator shaft. This riser is supported from the top by phosphor-bronze cable grips.

Down the abrupt sides of the Grand Canyon the Santa Fé Railroad had to run 12,000 ft. of three-conductor, 250,000-circ.mil steel-armored 2,300-volt cable weighing 10 lb. per foot; also a control cable containing two No. 10 wires. Both cables are supported by flexible cable grips placed over the armor. One section 500 ft. long, weighing 5,000 lb., is supported by a single cable grip and is illustrated in Fig. 3.

Probably the best application for flexible cable grips is in supporting multiple-conductor service cable, tree wire, circular-loom cable, twisted and parallel-pair telephone drop wire and all sorts of horizontal cables.

In South America, where concentric-type house service cable is used extensively to prevent unauthorized use of electricity, it is difficult to dead-end or anchor the service wires at the poles or houses by looping them around insulators because the lay of the copper wrapping would be disrupted if bent sharply. For this reason flexible bronze cable grips are used. Two sizes were adopted to support four sizes of cables—Nos. 6, 8, 10 and 12. Another

size of grip handles two- and three-conductor No. 8 and two-conductor No. 6 service cables. Between 25,000 and 30,000 of these grips have been installed in various South American countries during the last 1½ years with excellent results.

Rockville Center, L. I., has 2,000 of these grips supporting two- and three-conductor No. 8 service cable and reports a material saving over the old type of construction. Figs. 4, 5 and 6 show service attachments to poles and a house respectively. At the pole all the service wire grips are attached to lag screws in the pole. At the house end it has been possible to eliminate one insulator. If slack is left in the drip-loop and at the pole the latter can be shifted if necessary without resplicing service wires by adjusting the grip on the cable.

Three thousand grips have been installed for test by the Associated Telephone & Telegraph Company, which reports satisfaction with performance, and 1,500 have been purchased for use with twisted or parallel-pair service wires by the Latin American properties supervised by Electric Bond & Share Company.

One unusual application of cable grips has been made by the Kansas City Power & Light Company at Borger, Tex., to anchor 3-in. lead-covered cable buried 4 ft. deep in a hillside, and thus prevent slippage during landslides on the grades that run as high as 50 per cent. Phosphor-bronze split cable grips, 6 ft. long, are anchored to iron stakes driven in the ground (Fig. 7).

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Prefers Electric Furnace for Gray Cast Iron

Contrary to the usual opinion, production of gray cast iron in the electric furnace may be more economical in over-all cost than the cupola process. So said Clyde L. Frear, metallurgist of the De Laval Separator Company, recently when addressing the American Foundrymen's Association. Among the reasons given for preference of the electrical process were:

1. Much cheaper grades of raw materials may be used without detracting from the quality of the castings. Many raw materials may be used in the electrical furnace that it would be impossible to use in the cupola.

2. Flexibility of the process. The bath of molten metal may be held as long as desired in the furnace and at the same time may be heated to any desired temperature, thus using all the advantages which may result from this high temperature refining and its control. In addition the composition of the bath and the physical properties of the resultant castings may be changed as desired at any time during the melting or refining process, so that castings of any desired composition or properties may be obtained at will during the process.

If a ladle of iron should cool too far, as is often the case when pouring a large number of small castings, it is not necessary to pig this cool metal. It is only necessary to return it to the furnace and reheat to the desired temperature.

3. Smaller heats may be made economically in the electric furnace than could be made in the cupola, which is advantageous in periods of low production.

4. Ease of superheating the metal and consequent high refining and solution of the graphite make ladle additions of alloys more effective than with a metal that is only partially refined.

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French Output One-fifth for Chemicals

Statistics on electrical operation in France for 1930 and earlier years, recently made available in a publication of the Ministry of Public Works, show that the output doubled in a period of eight years. Water power is somewhat more important than in the United States, constituting from 40 to 45 per cent of the total.

The official data make no distinction between industrial and public utility plants. To separate the two, and thus afford comparison with the United States, it is probably fair to assume that the consumption for electrochemical purposes plus what is used directly at the terminals of the plants represents the output of private industrial establishments, while that delivered to networks corresponds essentially to public utility output.

For example, of the 15,339,336,000 kw.-hr. generated in 1930 4,361,058,000 kw.-hr. was used directly at the plants while 10,978,278,000 kw.-hr. was delivered to networks. For comparison it may be stated that the output of all public utility plants in the United States during the same year was 95,936,000,000 kw.-hr.

In making a comparison of losses in French and in American systems, the large amount of energy that apparently does not pass through distributing networks

Rating and Output of French Plants, 1930

	Thermal	Hydro	Total
Installed, kw.	5,592,692	2,328,092	7,920,784
Normally available, kw.	4,039,715	1,279,714	5,319,429
Output (1,000 kw.-hr.)	8,463,111	6,876,225	15,339,336

Consumption of Energy in 1930

(Thousands of Kw.-Hr.)

High Tension		Low Tension	
Traction	923,709	Light and domestic	1,428,151
Electrochemical	2,934,293	Power	1,108,139
Other	7,331,029	Combined	2,446,290
Total	11,189,031		
Total, high and low tension			13,635,321

Annual Production in Millions of Kw.-hr.

	1923	1926	1927	1928	1929	1930
Output						
Thermal	4,085	6,525	6,331	7,378	8,210	8,463
Hydro	3,405	4,743	5,057	5,598	6,142	6,876
Total	7,490	11,268	11,388	12,976	14,352	15,339
Imported	253	396	467	510	606	536
Exported	20	56	61	75	123	101
Available	7,723	11,608	11,794	13,411	14,835	15,774
Allocation of Output						
Electrochemical	1,500	2,102	2,164	2,637	2,874	2,934
Delivered through distribution systems	3,724	5,735	5,746	6,738	7,497	7,806
Used at plants	1,295	2,139	2,222	2,323	2,410	2,895
Total consumption	6,519	9,976	10,132	11,698	12,781	13,635
Losses	1,204	1,632	1,662	1,713	2,054	2,139
Use plus losses	7,723	11,608	11,794	13,411	14,835	15,774

should be taken into account. Total population in 1930 was 41,400,000, production per capita 384 kw.-hr., number of consumers 7,620,283.

The report from which these figures are abstracted is accompanied by a set of maps, on a scale of 1 : 500,000, showing location of power plants and transmission lines. A map of the United States to the same scale would be about 30 ft. wide.

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Looking Forward in Farm Wiring

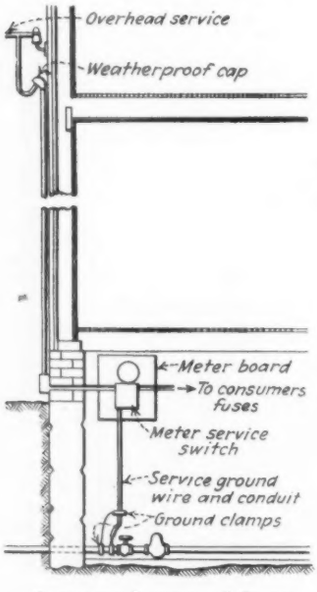
To aid prospective farm customers to obtain adequate wiring installations planned for future needs as well as immediate necessities, the New Hampshire Rural Electrification Committee has recently completed a number of recommendations which are embodied in its current report on rural line construction. W. T. Ackerman, research agricultural engineer, University of New Hampshire, Durham, is chairman. The committee points out that too little attention has been paid in the past to proper farm wiring, from the service entrance forward. It recommends that the rural service department of the utility company co-operate with the prospective customer in planning his wiring requirements, showing, however, that the power company has no financial interest in the wiring installation. It is strongly urged by the committee that all recommendations regarding farm wiring be made by the rural service representative, eliminating contacts with various specialists which in the past have proved annoyances.

The rural service representative should provide the prospective customer and of course the electrical contractor with the rules and regulations of the power company, explaining these in detail, emphasizing the importance of providing ample capacity for the future.

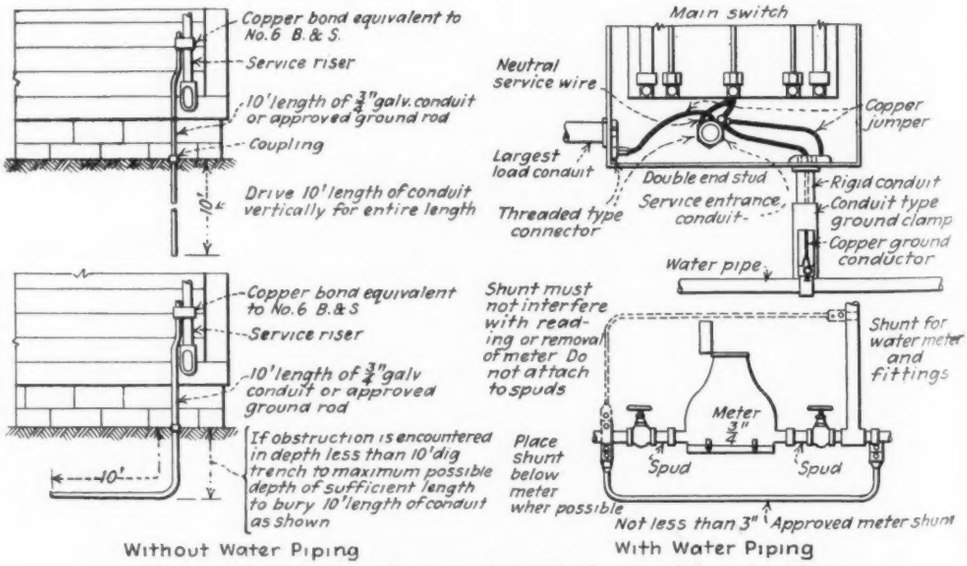
Most of the large electrical equipment used on farms, such as ranges, water heaters and pumps, operate either on 220 volts or on 110/220 volts, so that it is advisable to install a three-wire, 110/220-volt service. The committee points out that general experience has shown the minimum-size entrance to install is for 60 amp. with three No. 4 wires. Many installations of 100-amp. rating with three No. 1 wires have been made, and some authorities consider this the minimum, especially on farms where the use of electricity is just beginning. It may appear that a two-wire service of 30 amp. capacity is large enough for the initial load. This can be installed for about $20. When the load is increased, a larger service entrance is required, and a three-wire, 100-amp. service may cost $50. A proper entrance at the outset would have saved $20.

The rural service representative can help the farm customer to take a forward look in connection with the general wiring of farm and home buildings. Special attention, the committee states, should be given to convenience outlets, and it may be advisable to provide a separate No. 6 three-wire line to the kitchen in anticipation of a future electric range. Provision should also be made for the future installation of a water heater and/or refrigerator (in Vermont alone 115 electric refrigerators were sold in the last reported week). A separate heavy three-wire line is advisable to the barn to serve both light and power needs. All motors, the report states, should be operated on 220 volts and installed on separate lines. This applies to such installations as milking machines and water pumps. When a utility motor is to be used power receptacles should be installed adjacent to its points of common utilization. This will avoid stringing temporary wires, which are in the end expensive, inconvenient, dangerous and unsightly.

A separate three-wire line should be run to each chicken house to provide for adequate winter lighting and to serve brooders and incubators. Where hotbeds of the electrically heated type are used wires of sufficient capacity to furnish first-class service should be recommended. The committee believes that proper co-operation as to wiring layouts by rural service representatives will aid the provision of satisfactory service and contribute to excellent public relations.



Approved type of farm service entrance


Copper bond equivalent to No.6 B.& S.
Service riser
10' length of ¾" galv. conduit or approved ground rod
Coupling
Drive 10' length of conduit vertically for entire length
10'
Copper bond equivalent to No.6 B.& S.
Service riser
10' length of ¾" galv conduit or approved ground rod
If obstruction is encountered in depth less than 10' dig trench to maximum possible depth of sufficient length to bury 10' length of conduit as shown
10'
Without Water Piping
Main switch
Neutral service wire
Copper jumper
Largest load conduit
Double end stud
Rigid conduit
Service entrance conduit
Conduit type ground clamp
Threaded type connector
Copper ground conductor
Water pipe
Shunt must not interfere with reading or removal of meter Do not attach to spuds
Shunt for water meter and fittings
Meter ¾"
Spud
Spud
Place shunt below meter wher possible
Not less than 3"
Approved meter shunt
With Water Piping

Recommended ground connections for farms with and without water piping facilities

Bulk of Motor Outages on Voltage Dips Avoidable

By H. P. SLEEPER
Public Service Electric & Gas Company

A RATHER extensive investigation of the causes of interruptions to industrial motor installations made by the writer in the last few years has brought to light the startling fact that about 80 per cent of them were entirely unnecessary. This proportion of all interruptions was due to the motors being tripped off on voltage dips which occurred on the power systems due to short circuits on the supply lines. The remaining 20 per cent of outages was due to motor burn-outs, severe overloads which caused stalling, accidents to equipment, interruptions to the power supply and other miscellaneous causes. In a large number of cases which were investigated it was found possible to avoid practically all of the interruptions previously caused by the voltage dips by the application of simple remedies described below.

In the past ten years the electric utilities have made many improvements in their plants in an effort to better service to their customers. This has consisted largely of hook-ups with other utilities to insure reserve capacity, rebuilding of power and substations to modernize equipment, reconstruction of transmission lines to minimize outages especially to improve their lightning performance, modernizing of protective relay equipment to sectionalize defective lines and equipment without interrupting other parts of the system, and other general plant improvements of a technical nature. All of this has necessitated considerable research and testing and has involved the expenditure of a considerable sum of money by them. It has, however, resulted in a considerable decrease in the service interruptions to customers and has amply justified the investment.

Even with the above improvements, however, electric service is still not perfect, but such interruptions as are now experienced are of a different nature than previously, being largely unavoidable. The remainder are still too frequent and it is with these that we are particularly concerned. An analysis of them seems to indicate that they can be mostly avoided by certain precautions to be taken by the user.

It must be accepted by the user that a certain number of voltage dips are bound to be experienced on an electric service over a period of time. The bulk of these come from troubles which occur on the supply system, although a certain number are caused by short circuits in the same plant or neighboring plants on the same feeder. Since such disturbances are usually of extremely short duration and of magnitudes which vary from possibly 10 to 50 per cent of normal voltage, it follows that in a majority of such cases no trouble of any kind should be caused to rotating equipment. Experience shows that this is not the case and that dips of this nature usually cause an interruption to customers' processes served by motors.

The cause of the interruption is simple. A standard motor-starting equipment usually consists of a starting switch, a reactor or resistor, so as to allow the motor to be started at a reduced voltage, and a running switch which enables full voltage to be impressed on the motor under normal operating conditions. Protective devices in the nature of time-delay overcurrent and instantaneous undervoltage releases are ordinarily supplied with such equipment and are usually required by underwriters' rules. The overcurrent device protects the motor from severe overloads of sufficient duration to damage the windings, but allows it to operate with a momentary overload without disconnection. The undervoltage release disconnects the motor in case of voltage failure and hence protects it from having full voltage reapplied after the motor has stopped. The difficulty with this device is its instantaneous feature, which causes immediate opening of the running switch if the drop-out point of the release is reached even momentarily.

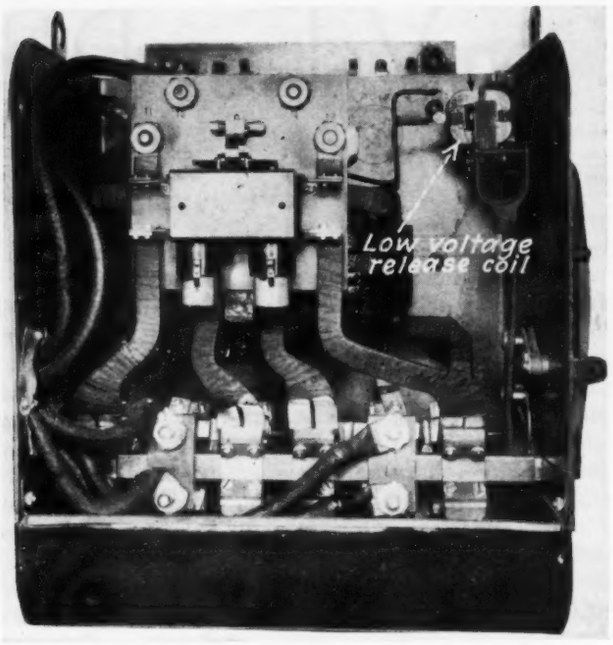
Let us observe what happens to a motor when a voltage dip occurs. First of all, the reduced voltage on the motor causes it to start to slow down, if it is non-synchronous. If the mechanical load is constant, or nearly so, the motor will draw a higher current so as to maintain full power output. This may start the time-delay overcurrent device to operate, and no damage is done unless the dip lasts too long. But the undervoltage device operates without discrimination. It is, or was, usually a plunger or armature arrangement which would operate instantaneously at a pre-determined value of undervoltage and trip out the starter switch and stop the motor.

Most instantaneous undervoltage releases operate when the voltage drops 10 to 25 per cent below normal. Some of the older types were found to be so sensitive as to operate on 5 per cent dips. Tests showed that if the voltage release was temporarily rendered inoperative the immediate voltage restoration, which usually follows the dip, would pull the motor back to normal speed without interruption. The obvious solution was to lower the drop-out point of the undervoltage release. But this could not be accomplished in a simple, practical and economical manner. Furthermore, such a solution still permitted improper operation on very low, quick dips and gave imperfect protection on delayed dips of moderate values that should have disconnected the motor automatically in a few seconds.

Solution that proved effective

The solution appeared to be obvious. A time-delay feature was added so that a dip lasting a second or two would not disconnect the starter switch if voltage were restored to normal immediately thereafter, assuming, of course, that the overload conditions were also satisfac-

These starters, which were used in silk mill and dye works respectively, were originally equipped with instantaneous low-voltage release. Substitution of the time element was made without much expense or trouble and the former outages were avoided.



Figs. 1 and 2—Costly outages on voltage dips avoided by time-delay low-voltage releases

tory. In addition, the voltage drop-out point has been lowered on most modern undervoltage releases to values of 50 or even 75 per cent below normal so that many dips leave the control equipment entirely unaffected.

Several hundred motors equipped with protective devices of this type have been under observation for two to three years. The users report almost 100 per cent correct operation. Dips of the ordinary variety no longer give any trouble. If the dips are of too long duration and the motor cannot pull back to normal speed, then either the time-delay overcurrent or the time-delay undervoltage device will operate and protect the motor from injury. On a properly constructed and relayed power system these cases should not constitute more than a very few per cent of all dips experienced.

The time-delay undervoltage release is not a perfect solution to this problem. In certain cases the slight reduction in motor speed when the dip occurs results in a flaw in the completed product. The continuity of the process is not affected, however, and the cost of scrapping the impaired material is usually less than the averted shut-down. The chief factor is the avoidance of the lost time of manufacture, which may vary from several minutes to occasionally several hours, depending upon the nature of the processes affected. In the majority of ordinary industrial applications of electric motors, however, there is no noticeable effect on the operation of the equipment and satisfactory "dip" protection is secured.

Remedy applied to variety of drives

Many of the problems investigated by the writer in this connection presented interesting phases. Perhaps one of the most interesting was that presented in a silk thread mill. A 15-hp. electric motor drove a shafting which in turn drove several hundred spindles, each wound with many yards of cocoon silk thread. Twelve spindles were grouped together and the process wound the twelve infinitesimally small threads into one single silk thread as we ordinarily know it. When a dip occurred and shut the motor down without warning it caused every small thread on all spindles to snarl and break off. It was then necesary for an attendant to tie together the ends of hundreds of tiny threads before the process could be restarted. The labor waste was costly and the machine time lost was serious.

The solution was simple. A very common type of starter has been used equipped with an instantaneous undervoltage release of the ordinary variety. Fortunately, the manufacturer of this device makes a time-delay undervoltage release which was used to replace the instantaneous type without much expense or trouble (Fig. 1). The customer was entirely satisfied with its operation and it paid for itself in the first few months of use.

Another customer who was using a similar starter had an entirely different problem, but used the same solution with equal success. A deep well pump supplied water which was used in a yarn dyeing process. When the motor was tripped off by a voltage dip the head of water was dropped and the water in the well was violently stirred up. This agitated dirt which lay in the bottom of the well and the whole mass of water became too dirty to use in the process. As a result it was necessary to wait an hour for the dirt to settle sufficiently to enable clear water to be pumped. The addition of a time-delay undervoltage release (Fig. 2) cured this case completely.

Not restricted to small motors

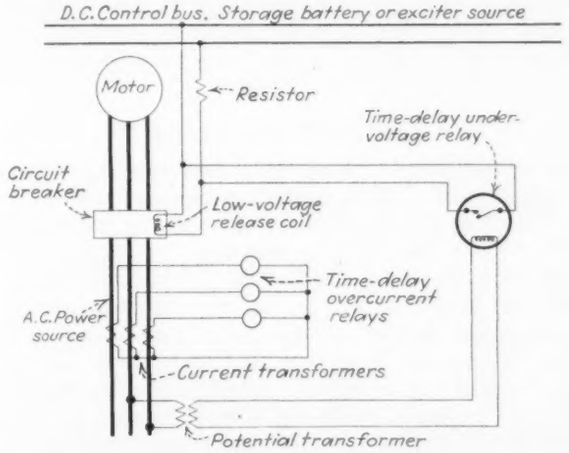
The principle of the time-delay undervoltage release is not restricted to small motors. In one case a 1,500-hp. motor-generator set gave a lot of trouble from interruptions on voltage dips. It was one of two similar sets which were used to supply direct current for various processes in a large wire mill and was started by a "start and run" oil circuit breaker. The instantaneous undervoltage release which gave the trouble can be seen between the two breaker handles in the picture of the starting equipment (Fig. 3).

This case was solved by a little different method but the same principle. The coil of the undervoltage release was disconnected from the a.c. supply and connected to

the 125-volt dc. control bus through a resistor (Fig. 4). A time-delay induction type undervoltage relay, was connected into the circuit so that it would operate on a.c. voltage dips, but with a time delay of approximately two seconds. If the duration of the dip was in excess of two seconds the running breaker would be tripped out by the closing of the undervoltage relay contacts. This scheme, which was very simple and economical to install, gave excellent satisfaction in operation and no trouble is now experienced in holding this set on the line during ordinary voltage dips. In another similar case there was no direct current available and a small 12-volt storage battery and charger were applied and used to energize the undervoltage release coils. The same scheme was applied with complete success to a 100-hp. synchronous motor driving an ammonia compressor.

When time-delay attachments cannot be purchased

This general scheme can frequently be applied to many of the older types of motor starters for which no time-delay attachments can be purchased. One case where it was applied at a minimum of cost may prove of interest. Artificial ice plants are very seriously disturbed by outages due to voltage dips. Such an interruption may stop the flow of air to the freezer and the absence of the agitating air causes the production of white ice, which is unsalable. Furthermore, it may damage the ammonia compressor by allowing liquid ammonia to enter the compressor cylinder, unless automatic valves are installed on the machines. And a further complication to the problem is the fact that the motors used on ammonia compressors are usually synchronous.



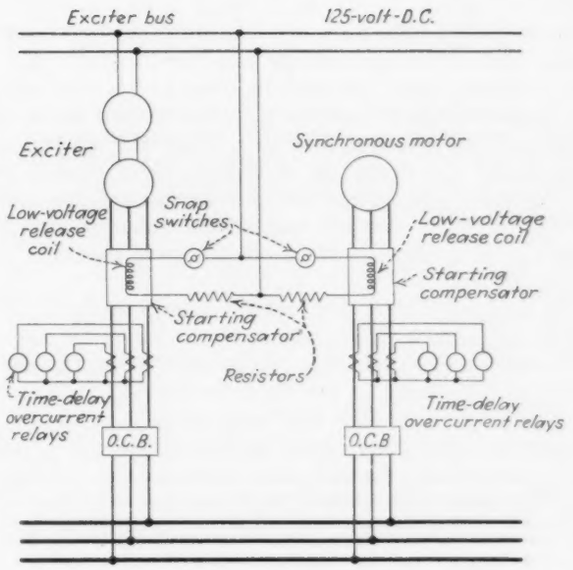
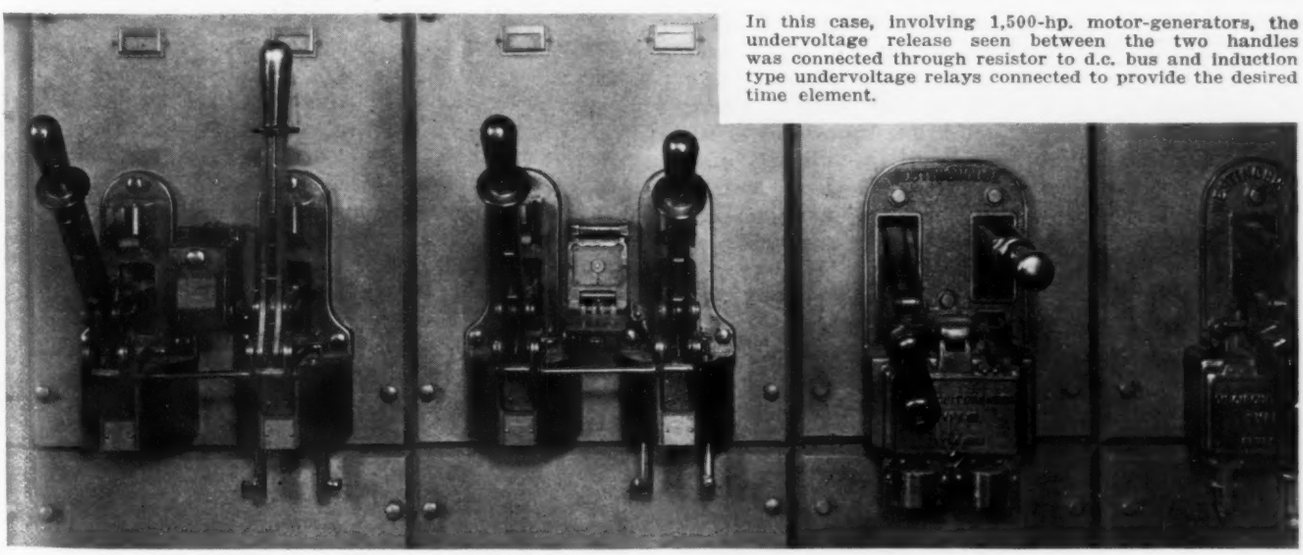


Fig. 5—Delayed low-voltage release obtained without time-delay relays

In this case a synchronous motor-driven ammonia compressor had to be protected from unnecessary outages on voltage dips. The low-voltage release coils were connected to a small motor-generator on the compressor. When a dip occurred all motors started to slow down and the d.c. voltage of the motor-generator decreased with speed. Consequently when their speed had dropped a predetermined amount the low-voltage relays would operate. Overload relays provide thermal protection.

One solution in this case was to connect all a.c. undervoltage releases to the d.c. bus through resistors (Fig. 5), the d.c. source being a small individual motor-generator set on each compressor. Advantage was taken of this fact and no time-delay relays were used. When a dip occurred the motors all started to slow down and the d.c. voltage of the motor-generator set also decreased



In this case, involving 1,500-hp. motor-generators, the undervoltage release seen between the two handles was connected through resistor to d.c. bus and induction type undervoltage relays connected to provide the desired time element.

Figs. 3 and 4—Start-and-run breakers adapted to delayed low-voltage release

with the speed. If the a.c. voltage restored quickly all motors pulled back into step and there was no interruption. But if the a.c. voltage was slow in restoring, the d.c. voltage would continue to drop and would trip out the undervoltage releases at a predetermined value. This scheme gives a longer time delay than the scheme using relays and the operation of the overload devices must be depended upon for thermal protection of the motors. It is, however, a very economical scheme, simple to apply, and in the case mentioned it gave excellent operating results.

In applying time-delay undervoltage protection to synchronous motors great care must be taken to ascertain that the damper windings are ample. If this is not the case, and on many of the older motors it is not, the set will not pull back into step even after a small dip and the overcurrent relays must operate to clear it. Usually only synchronous motors which are of the full voltage starting type will operate satisfactorily with time-delay low-voltage protection. The writer has, however, applied it to some of the older types of synchronous motors with considerable success.

Time-delay push-button control

Another type of motor control which also gives trouble and requires special treatment is the push-button type of starter. Ordinarily push buttons are used at several distant control points to start motors which are equipped with full automatic self-starting equipments. These usually throw the motor onto the line at reduced voltage through a resistor or reactor, and when proper speed is reached the starter is then automatically thrown into the running position without attention on the part of the operator.

Such equipments receive their control energy from the a.c. supply and hence all of the control electromagnets act as instantaneous undervoltage releases. When a voltage dip occurs on the system all electromagnets which are being held closed electrically are caused to open if the voltage is sufficiently reduced, and this of course stops the motor.

Unfortunately the solution for this type of equipment is not simple. It is possible to obtain special control equipment whereby the electromagnets are latched into place, but such special equipment is expensive. The use of d.c. coils on all contactors is another and cheaper solution. This eliminates the tendency to drop out on a.c. dips, but also requires special equipment and a source of d.c. energy. The most economical solution, where it can be applied without injury to the process, is to use a time-delay push button in place of the ordinary instantaneous type push button. This device has a coil connected to the a.c. source. It is equipped with an escapement mechanism whereby it starts to release with a time delay when a dip occurs, but the actual opening of the control circuit is not affected unless the delay exists for several seconds. If full voltage is restored before the time element lapses the motor, which has been disconnected from the line by the dropping out of the a.c. contactors, is automatically restarted, since the control circuit through the push button has not been opened. This means, however, that the motor will have been disconnected for a matter of a second or two and if sufficient inertia is not present may have come to complete rest and of course will go through the starting cycle again.

If the fabrication process does not permit the use of this scheme it will then be necessary to resort to one of the special control schemes previously described. The time-delay push button may also be used economically as a time-delay undervoltage relay in some of the schemes previously referred to and offers a very rugged device for such purposes.

Another reason for using time-delay undervoltage devices, which is assuming some importance, is the practice of instantaneously reclosing power feeders after trip-out in order to restore power in the quickest possible time. This scheme causes the circuit to be de-energized and re-energized in a period of less than one second in most applications, but during this period zero voltage exists on the circuit and the use of time-delay undervoltage devices is mandatory if disconnections are to be avoided. This subject has been rather completely covered in previously published articles in this magazine.*

There are certain motor applications where the use of any type of undervoltage release is undesirable. A common example of this is a motor-driven elevator where continuity of service is more important than safety to equipment. Another example is that of a series of motor-driven processes which are continuous and mechanically interconnected. Under such circumstances it is obvious that the interruption of one part might readily cause congestion and possible damage to the product and equipment in another part. Under these circumstances, with proper supervision, it is usually preferable to omit all voltage release equipment on the individual mechanisms. Such cases, however, are unusual.

Justification of expense

The installation of time-delay undervoltage protection on all standard motor-control equipment will probably require an expenditure of some money by users of electrical power. Whether or not this is justified on older equipments is for the individual to decide. However, when the matter of purchasing new equipment is under consideration serious thought should be given to time-delay protection. It is true that at present the cost of motor starters so equipped is slightly greater than when they are equipped with the old instantaneous type of releases. However, most manufacturers are now able to supply motor starters equipped with time-delay undervoltage releases as an optional standard, and their increased use will inevitably lower any cost differential that may exist.

The writer hopes that this article will influence industrial engineers to make a survey of installations under their jurisdiction. Frequently such a survey will bring to light conditions which have consistently caused trouble, inconvenience, loss of time or damaged product, which have been accepted by those in immediate charge as inevitable, but which are capable of almost complete correction. In many cases it will be found that the remedy is very simple and inexpensive to apply, such as a small amount of rewiring of certain coil control circuits to use d.c. control energy instead of alternating current. Others can be improved by the replacement of a standard

*"*Service Continuity Promoted by Rapid Breaker Reclosure*," Robert Treat and H. C. Verwoert, ELECTRICAL WORLD, *August 6, 1932, page, 172; "Year's Experience Justifies Instantaneous Reclosing," E. E. George,* ELECTRICAL WORLD, *October 29, 1932, page 606; "Rotational Energy Tides Converter Over Power Failure," L. W. Hayward,* ELECTRICAL WORLD, *December 10, 1932, page 782; "Synchronous Blower Motor Rides Through 30 Cycles Outage," L. W. Hayward,* ELECTRICAL WORLD, *December 17, 1932, page 826.*

push-button controller with one of the time-delay type at a low cost. In other cases, where conditions permit, several motors can have their controls grouped together on one set of starting equipment protected by time-delay overcurrent and time-delay undervoltage devices. Other situations may require more elaborate treatment. Frequently such a survey will detect a few applications where treatment of this nature will result in economies of an amount far beyond the immediate expenditure involved.

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Interconnection Terms Defined

To facilitate studying interchange operations between the Boston Edison Company and the New England Power Company in the former's rate case an exhibit was recently filed by the Edison Company defining several terms employed in agreements between the two companies:

Freshet Electricity—Electricity available on a system from hydroelectric resources in excess of the system's requirements, as a result of rapid runoff caused by rain or melting snow.

Increment Cost—Increment cost applied to electrical production is the amount by which the total cost of producing a given amount of electrical energy measured in kilowatt-hours is exceeded by the total cost of producing a larger amount of electrical energy. This unit increment cost is the excess cost divided by the additional kilowatt-hours. Costs depending upon investment are not involved unless new investments are required to produce the additional kilowatt-hours. The term is also used negatively, or in the sense of "decrement cost," this being the cost which is saved by producing fewer kilowatt-hours than a given amount.

Interchange Electricity—Electricity produced from spare capacity of a system and transferred to another at prices determined from a consideration of increment costs. While the term implies exchanges (of energy) it is not so limited in our (Edison and New England Power) usage, any transfer of the character above described being commonly called "interchange electricity."

Firm Power—Power delivered under an agreement that the total capacity contracted for shall be available at the call of the purchaser at any and all times for continuous use, and that the capacity is guaranteed to be stable or firm, within reasonable limits, by the maintenance by the seller of appropriate plant and reserves. In a less strict sense, the total period of use of capacity may be limited without the power losing its firm character, if such limitation does not encumber the customer's operations. If it were necessary to develop a nomenclature, we might refer to "firm power" available for continuous use as "unlimited firm power," and to the kind of power furnished, for example, under the 1928 contract for primary power between Edison and New England, as "limited use firm power." In any case the term "primary" in the contract has no different meaning than "firm," but is more euphonious and is commonly used by New England Power Company in this sense. It is not commonly used by the Edison Company because of the use of the same word in connection with (primary) distribution voltages.

Secondary Electricity—This term is not in common use by the Edison company and its exact significance probably varies. In its broadest sense it could probably be applied to any electricity which is not defined as "firm" or "primary"; for example, it includes "interchange electricity."

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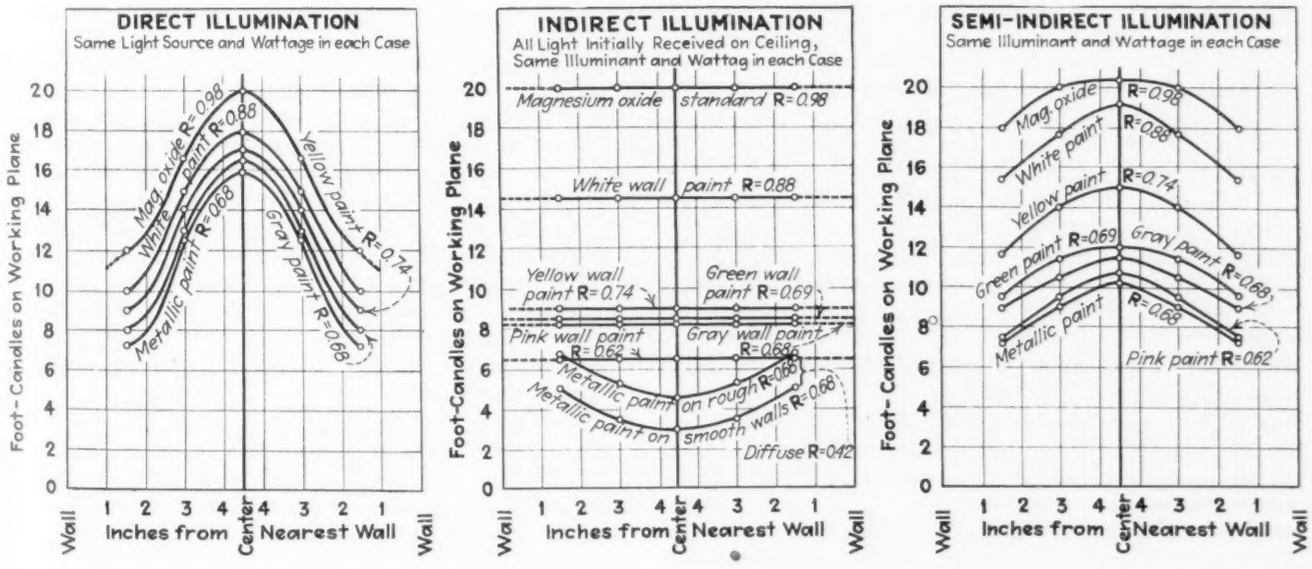
Value of Paints as Aids to Lighting


DIRECT ILLUMINATION
Same Light Source and Wattage in each Case
Foot-Candles on Working Plane
Mag. oxide R=0.98
White paint R=0.88
Yellow paint R=0.74
Gray paint R=0.68
Metallic paint R=0.66
Wall 1 2 3 4 Center 4 3 2 1 Wall
Inches from Nearest Wall
INDIRECT ILLUMINATION
All Light Initially Received on Ceiling, Same Illuminant and Wattag in each Case
Magnesium oxide standard R=0.98
White wall paint R=0.88
Yellow wall paint R=0.74
Green wall paint R=0.69
Pink wall paint R=0.62
Gray wall paint R=0.66
Metallic paint on rough walls R=0.66
Metallic paint on smooth walls R=0.68
Diffuse R=0.42
SEMI-INDIRECT ILLUMINATION
Same Illuminant and Wattage in each Case
Mag. oxide R=0.98
White paint R=0.88
Yellow paint R=0.74
Green paint R=0.69
Gray paint R=0.68
Metallic paint R=0.66
Pink paint R=0.62

The accompanying curves are based on a paper presented before the I.E.S. by D. L. Gamble, research division, New Jersey Zinc Company. These data were obtained by making miniature duplicate rooms, differing only in wall and ceiling paint. The lighting source for each set of curves was adjusted to give about 20 ft.-candles at center of working plane with the magnesium oxide standard. While the curves do permit comparing paints for similar lighting, they do not permit comparing different forms of lighting. A popular presentation of these data are given in the company's booklet "Using Paint as Light."

For semi-indirect lighting a translucent glass bowl reflecting most of its light on the ceiling and sidewalls was used, allowing some light to come through the reflector onto the working plane.

Small Increase in Water Power

Capacity of water-power plants in the United States increased by a smaller percentage during 1932 than in any other year since the Geological Survey began publishing statistics on that subject, a dozen years ago. The increase was 255,136 hp., or 1.6 per cent, bringing the total at the end of the year to 15,817,941 hp.

The following table shows the total capacity at different dates and the increase between dates:

Date	Horsepower	Increase Per Cent	Date	Horsepower	Increase Per Cent
1921 (Nov.)	7,926,958	....	1929 (Jan. 1)	13,571,530	10.4
1924 (March)	9,086,958	14.6	1930 (Jan. 1)	13,807,778	1.7
1925 (March)	10,037,655	10.5	1931 (Jan. 1)	14,884,667	7.2
1926 (Jan. 1)	11,176,596	11.3	1932 (Jan. 1)	15,562,805	4.3
1927 (Jan. 1)	11,720,983	4.9	1933 (Jan. 1)	15,817,941	1.6
1928 (Jan. 1)	12,296,000	4.9			

As will be apparent from the table giving capacity by regions, all but 11 per cent of the installed hydraulic horsepower in the country is in public utility and municipal plants. In New England the portion in manufacturing plants still amounts to 41 per cent. In Massachusetts it rises even higher, to 55 per cent, and in Rhode Island to 89 per cent. For data by states reference should be made to the Survey report.

Total Capacity of Waterwheels at Water-Power Plants in the United States

January 1, 1933 (Plants of 100 hp. or more)

Division	Total: Number of plants	Total: Capacity in horsepower	Public utility and municipal: Number of plants	Public utility and municipal: Capacity in horsepower	Manufacturing and miscellaneous: Number of plants	Manufacturing and miscellaneous: Capacity in horsepower
United States	3,337	15,817,941	1,611	14,023,695	1,726	1,794,246
New England	1,198	1,946,655	266	1,144,476	932	802,179
Middle Atlantic	579	2,395,766	254	2,162,100	325	233,666
East North Central	402	1,139,209	266	889,075	136	250,134
West North Central	193	767,368	146	656,192	47	111,176
South Atlantic	326	2,978,995	190	2,859,771	136	119,224
East South Central	51	1,363,678	37	1,237,359	14	126,319
West South Central	37	149,551	30	147,706	7	1,845
Mountain	244	1,211,945	189	1,190,691	55	21,254
Pacific	307	3,864,774	233	3,736,325	74	128,449

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READERS' FORUM

"Lighting an Exposition"

To the Editor of the ELECTRICAL WORLD:

My attention has been called to your issue of May 27, 1933, in which appears an article by W. d'Arcy Ryan entitled "Lighting an Exposition." With all due respect to Mr. Ryan and his associates, the article conveys an erroneous impression that the entire work of illuminating A Century of Progress was performed by the General Electric and Westinghouse companies.

The fact is that many of the most spectacular, and certainly the most unusual, lighting features of the World's Fair were planned, produced and installed by Federal Electric Company. I refer to the many examples of neon or gaseous-conductor lighting.

More than 40,000 linear feet of gaseous tubing was placed on the exteriors and interiors of exposition structures by Federal Electric Company. This is by far the largest undertaking of its kind ever attempted and marks a significant forward step in the history of architectural color illumination. For the first time gaseous tubing is seen on a large scale used for other than advertising display purposes. Architects and engineers who have studied these installations have declared that the development of this new lighting technique may prove to be the outstanding architectural result of the fair.

Since 1930 Robert E. Barclay, director of research for Federal Electric Company, has been working with the officials of A Century of Progress on the lighting of various exposition buildings with gaseous tubing. Numerous difficulties had to be overcome, but so successfully did the plans and suggestions of Mr. Barclay and the Federal engineering staff work out that two certificates of recognition were awarded to the Federal Electric Company by the trustees of the fair.

The illustration on page 687 of your May 27 issue shows the tower of the Hall of Science, which is illuminated with red and blue Federal neon tubing, more than 2,700 ft. being used on this single installation. It is difficult to reconcile this with Mr. Ryan's statement, directly adjoining, to the effect that "Exterior illumination at A Century of Progress exposition may be summarily described as decorative floodlighting in static white light."

At the north approach to the Hall of Science the Federal organization has installed 1,800 ft. of tubing. The General Exhibits Group, immediately south of the Hall of Science, has almost 7,000 ft. of tubing, ordered by exposition officials after they had witnessed the installations on the Hall of Science and were thoroughly sold on the beauty and efficiency of this lighting.

The mighty cascade effect on the west façade of the Electrical Building, which many observers have called the most striking sight of the entire World's Fair, is made up of seven banks of blue gaseous-conductor tubes each 55 ft. in height, a total of 4,600 ft. of tubing. They are not, as Mr. Ryan states, "mercury-vapor tubes," but the regulation Federal gaseous-conductor tubes containing argon gas with a small quantity of mercury added.

Each of the entrances to A Century of Progress is illuminated by from 200 to 500 ft. of gaseous tubing, produced and installed by Federal. Other important installations occur on the Federal Government Building, Social Science Hall and the Italian Building.

Among the interior illuminating work done by means of Federal gaseous conductor tubes I might mention the Great Hall in the Hall of Science, with more than 600 ft. of tubing; the Grand Staircase in the Electrical Building, which has 1,200 ft. of Federal neon or red tubing in coves along its four setbacks, and the Trustees' Room in the Administration Building, with its famous "golden portal" illuminated by 236 ft. of gold tubing.

Prominent among the exhibitors using gaseous tubing for lighting purposes are: Illinois Central System, General American Tank Car, Pullman Company, Gibson Refrigerator Company. The dominant commercial display at the fair, the giant Havoline thermometer, operates with 1,200 ft. of Federal neon tubing.

Federal Electric Company. **F. A. ORTH.**

Men of the Industry

F. M. Kerr New President of Montana Power

Frank M. Kerr, for the past eighteen years vice-president and general manager of the Montana Power Company, has been named president to succeed the late John D. Ryan. Practically all of Mr. Kerr's 43 years of association with the electrical industry has been spent in Montana. He came to Butte in 1890 as a representative of the Northwest Thompson-Houston Company to assist in the construction of the first incandescent lighting plant to serve that city. He remained as chief operator of the plant, later holding the position of chief engineer and assistant superintendent of the Butte General Electric Company, which was the early operating company serving Butte.

Upon the formation of the Montana Power Company, in 1912, Mr. Kerr became general superintendent of the company and in 1915 vice-president and general manager. JAMES R. THOMAS, assistant treasurer of the Montana Power Company, has just been made treasurer. Mr. Thomas has been associated with the company at various times since its inception in 1912. In 1923 he became traveling auditor and in 1925 assistant treasurer.

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JOHN W. BAUMGARTNER, formerly president of the municipal Water and Power Commission of Los Angeles, has been appointed chairman of the City Council's water and power committee following the inauguration into office of a new municipal government on July 1. Mr. Baumgartner has been succeeded as president of the Water and Power Commission by Dr. JOHN R. HAYNES.

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ARTHUR P. GOOD, chief inspector of the Commonwealth Edison Company, has been appointed assistant superintendent of the meter department, effective July 1, 1933. Mr. Good has twice been chairman of the wiring sales committee of the National Electric Light Association, chairman of the standardization committee of meter and service entrance devices, is one of seven light and power group members of the electrical committee of the National Fire Protection Association which makes the National Electrical Code, was one of four utility representatives on the National Industry Conference on Wiring in 1927 and has been a member of the electrical commission of the city of Chicago. Mr. Good is the author of the section entitled "Wiring of Buildings and Industrial Plants" in the Standard Handbook for Electrical Engineers. T. P. WILLERTON, a graduate of the University of Illinois in electrical engineering, has been advanced from the position of assistant chief inspector to chief inspector.

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F. D. Campbell Heads Staten Island Utility

Floyd D. Campbell, vice-president and general manager of the Staten Island Edison Corporation since 1929, was elected last week president and a director of that utility. Mr. Campbell has been identified with the Associated Gas & Electric System for several years. He went to Staten Island from the Broad River Power Company, Columbia, S. C., where he was general manager.

He studied engineering at the University of Wisconsin and from 1912 to 1918 was associated with several casualty companies in various capacities in connection with investigation and inspection work in the industrial and construction field. Following the World War he was employed by W. S. Barstow & Company, engineers, and engaged in general construction work in connection with generating plants, gas plants, transmission and distribution systems on the properties of General Gas & Electric Corporation. From 1924 to 1927, until he went to the Broad River Power Company, he was general superintendent of Pennsylvania Edison Company and assistant general manager of New Jersey Power & Light Company.

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PAUL SAMUELL of Jacksonville and G. GALE GILBERT of Mount Vernon, Ill., retired July 1 from membership on the Illinois Commerce Commission, the Illinois General Assembly having reduced the membership of the commission from seven to five members.

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OBITUARY

H. D. Arnold

Harold De Forest Arnold, director of research of the Bell Telephone Laboratories, died of a heart attack July 10 at his home in Summit, N. J., in his fiftieth year. Dr. Arnold was among the

first to appreciate the necessity for a high vacuum in order to realize the full possibilities of the three-element vacuum valve and assisted in research to discover means of obtaining it. He designed not only vacuum tubes but methods for their manufacture as a part of the telephone industry. While engaging in this work he introduced the oxide-coated filament as a source of electrons and adapted tubes to use in long-distance wire and radio communication. In recognition of this work he received the John Scott medal in 1928. A statement from the Bell Laboratories said that "under his efficient direction, not to mention his very definite contribution of ideas, fundamental research work upon many phases of the communication art has been carried on. These have notably advanced the whole telephone art, both wire and radio; they have made available new methods in land wire telegraphy; in submarine cable telegraphy they have furnished a new type of cable with appropriately modified methods of operations; they have given new methods of recording sounds, making possible improved phonograph records and making practical the so-called talking movie, and finally, not to extend the statement further, this work finds more or less direct application to the problem of those with impaired hearing."

Dr. Arnold was born in Woodstock, Conn., and received his undergraduate training at Wesleyan University. After further graduate work at the University of Chicago under Professor R. A. Millikan and a year as a professor at Mt. Allison University, he received the degree of doctor of philosophy from Chicago in 1911. Then entering the Research Laboratories of the Bell System, he was one of the scientists who laid the foundation for what is now Bell Telephone Laboratories, Inc. He was a member of the American Institute of Electrical Engineers, the Franklin Institute, the American Association for the Advancement of Science and the American Chemical Society.

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ALBERT E. ALKINS, assistant to the electrical superintendent of the Lynn factory of the General Electric Company, died July 4 at Swampscott, Mass.

New Equipment Available

Reclosing Device for Oil Circuit Breakers

An inexpensive, direct-acting reclosing device, designated as type SM, for use with oil circuit breakers has been announced by the General Electric Company. This attachment will reclose a breaker one, two or three consecutive times, with equal time intervals between reclosures, when the breaker is tripped by overload, it is claimed. If the overload still exists after the last reclosure, the breaker will remain locked open and it will be necessary to close it manually before any further automatic operation takes place.

The attachment is a mercury-tube device in which timing is obtained by running mercury through an orifice into a reclosing contact chamber. It is directly connected to the breaker mechanism and is available with both solenoid and motor-operated breakers. It can be furnished with outdoor breakers and switch house equipments, also for use with indoor breakers which have various mountings such as pipe or angle iron framework and metal-inclosed.

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Combination Coal and Oil Burners

Combination pulverized-coal and oil burners for water-cooled furnaces have been announced by the Babcock & Wilcox Company, New York. The oil burner is of the twin-nozzle type and is inserted between two tubes in front of the pulverized-coal burner, extending back and through the burner casing, supported by a guide trough between the casing and the burner tip. The oil-burner tips are set so that the oil is distributed across the air stream to obtain a satisfactory mixture of fuel and air.

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Electrode Designed for Welding Cromansil Steel

Two additions to the "Murex" line of heavy mineral-coated, arc-welding electrodes have been announced by the Metal & Thermit Corporation, New York. One is a special electrode designed for welding "Cromansil" steel, a new development in high-strength steels having a tensile strength of 80,000 to 100,000 lb. per square inch along with high ductility.

The second addition is an electrode which deposits a metal containing 4 to 6 per cent chrome and 0.5 per cent molybdenum. It is especially suited to the welding of petroleum refinery equipment where metal of this type is used extensively.

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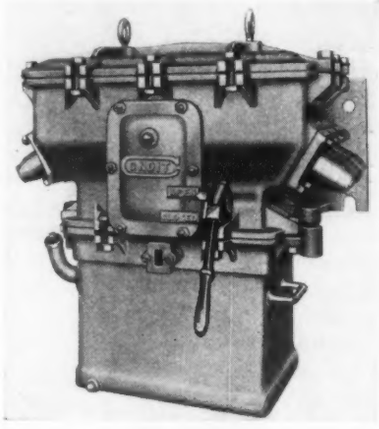
Subway Oil Switch for 7,500-Volt Service

A new subway oil switch for 7,500-volt service is announced by the Condit Electrical Manufacturing Corporation, Boston, Mass. It is designated as type EM-50. The switch is of sturdy watertight construction for wall mounting in subway or manhole, or in locations



where there is danger of flooding. It is furnished with single-conductor cable sleeves or multi-conductor cable bell, both of which are of cone shape construction, making them readily adaptable by cutting for the particular size of cable used. The operating handle is directly connected to the mechanism through a stuffing box which carries the position indicator.

The oil tank is equipped with oil gage, filling plug and drain plug. Wide gaskets are provided at all joints, affording watertight construction. Type EM-50 is furnished manually operated, non-automatic, two, three and four pole, single throw and two and three pole, double throw (with or without interlocks), for 200 and 400 amp. at 7,500 volts.

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HIXLEY ANCHOR TAPS, which by means of mechanical connection simplify cable-tapping operations and in addition provide in themselves cable supports for various sizes of wire from No. 1/0 to 1,000,000 circ. mil, have been announced by the Trumbull Electric Manufacturing Company, Plainville, Conn.

Drum Switch for Reversing Small Motors

Drum controllers for reversing fractional-horsepower motors have recently been announced by the Furnas Electric Company, West Allis, Wis. These drums are designed for use with small bench lathes, but may be used for practically any other application where it is desired to reverse small motors, it is claimed. They may also be used for plain starting and stopping where accurate control is an important consideration. Due to the absence of snap action, very much more accurate control is possible than with snap switches.

The construction frame is formed from heavy gage steel in one piece. Top is of drawn steel with flange to protect top edge of cover, thus making the case practically drip-proof. Rotor contacts are formed of hard-rolled copper and are securely locked in place, but are easily renewable. Both rotor contacts and fingers are very heavy for the rating of the switch.

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Four-Duty Couplings

Couplings which perform four important duties, starting, coupling, cushioning and limiting of load, are announced by the Falk Corporation, Milwaukee, Wis. The Falk-Rawson four-duty coupling makes possible, it is claimed, important savings in electrical equipment, protects the machine or the product and cuts electrical bills by reducing inrush current and allowing the selection of smaller motors operating closer to their maximum capacities.

The primary function of the Falk-Rawson coupling is an automatic starter, centrifugally operated. Essentially, the construction involves merely two drum-shaped members, one attached to the driving shaft and the other to the driven shaft. Between driving and driven members are inserted two sets of floating segments, made usually of brake lining reinforced with lead, the amount of lead being calculated to give the required centrifugal pressure for carrying the load. The outer segments are actuated by the driving member and the inner by the driven member.

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"TROL-E-DUCT," A MOBILE TROLLEY SYSTEM for conveying electric current, safely and efficiently, to moving or portable electric devices such as lamps, drills, screwdrivers, etc., has been announced by the Bull Dog Electric Products Company, Detroit, Mich. It consists essentially of standardized, self-contained sectional units of steel duct, inclosing insulated busbars which distribute electric current through trolleys to portable electric tools or other moving loads.